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BULLETIN

OF THE

RAFFLES MUSEUM

Singapore, Straits Settlements

No. 5 August 1931

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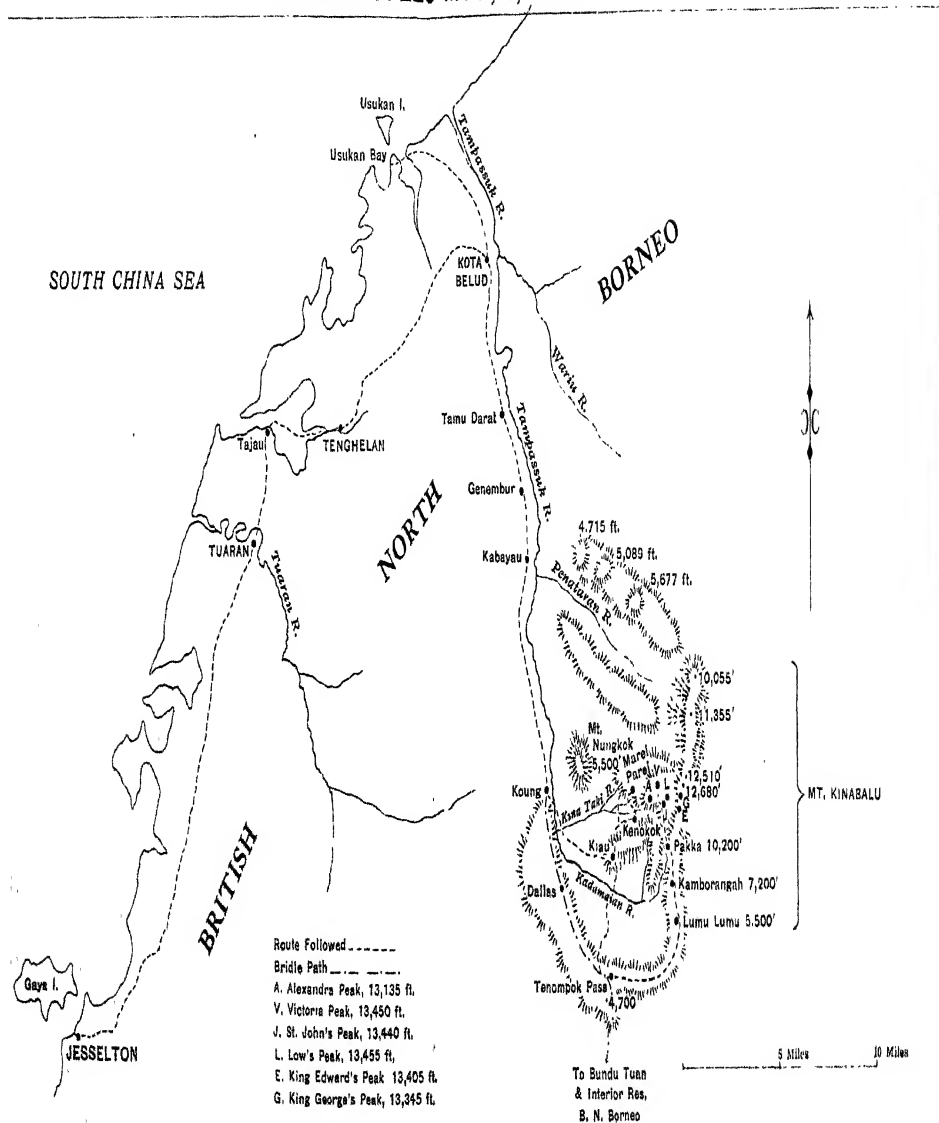
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MT. KINABALU AND ROUTES.

Mount Kinabalu: a Note

In June 1928, in company with the late Mr. J. L. Humphreys, C.M.G., then Governor of British North Borneo, I made a reconnaissance of Mt. Kinabalu, the highest peak in Malaysia, to plan a collecting visit to the mountain which had been by no means exhaustively explored, though several times visited by zoologists (*vide* Moulton, Journ. Sarawak Museum, II, 1915, pp. 136-170 and maps). The expedition was carried out in the following year during my absence in Europe, by Messrs. F. N. Chasen, Curator, Raffles Museum, Straits Settlements, and H. M. Pendlebury, Systematic Entomologist, Federated Malay States Museums. The reports on the vertebrates and on the invertebrates other than insects, will be given in this "Bulletin": the entomological papers in the "Journal of the Federated Malay States Museums".

The accounts of the mountain fauna may profitably be compared with those of the collections made in the North Borneo lowlands by Messrs. Chasen, Pendlebury and myself in 1927 in process of publication in the journals named.

The route taken by Mr. Humphreys and myself (accompanied by Messrs. R. F. Evans and G. H. Vinen, District Officers, the former of whom made all arrangements for the journey) was a little different from that followed by the later party. Our stages, each of one day, were:—Kota Belud—Kabayau, Kabayau—Dallas, Dallas—Tenompok Pass—Bundu Tuhan, Bundu Tuhan—Tenompok Pass—Lumu Lumu—Kamborangah, Kamborangah—Pakka, Pakka—Summit—Pakka, Pakka, etc.,—Bundu Tuhan, Bundu Tuhan, etc.,—Koung, Koung—Kabayau, Kabayau—Kota Belud; *i.e.*, ten days travelling.

At Jesselton and at the various stopping places I took as many readings (always at 4 P.M.) as possible of a boiling point thermometer with the following result. In the first column each height is calculated from that of the station directly below it, in the second column the height of each station is obtained by reference to sea-level at Jesselton. The third column gives the average of the two results. Compensation for temperature has been made.

		Feet	Feet	Feet
Kota Belud	...	188	188	188
Kabayau	...	590	601	596
Koung	...	1,285	1,304	1,295
Dallas	...	3,126	3,153	3,140
Bundu Tuhan (Resthouse)	...	4,016	4,067	4,042
Kamborangah	...	7,190	7,210	7,200
Pakka	...	10,195	10,226	10,211

The latest determined height of Kinabalu (that by Capt. Learmouth, of H. M. Survey-ship "Merlin," who spent five days observing at the summit in 1910) is 13,455 ft. (Low's Peak). Six peaks have heights of more than 13,000 ft.

The minimum temperature during a night spent at Kambor-angah was 48F., during two nights spent at Pakka 42F.; at mid-day on the summit in beautiful weather the shade temperature was 43F. Ice is known to form at the foot of Low's Peak: Mr. R. F. Evans observed this when he spent a night on the peak some two or three years before my visit. *C. Boden Kloss, Director of Museums, Straits Settlements and Federated Malay States.*

The Herpetology of Mt. Kinabalu, North Borneo, 13,455 ft.

By MALCOLM A. SMITH, *F.Z.S., F.L.S.*

(Plates I and II and 3 text figures)

With an INTRODUCTION by F. N. CHASEN, *C.M.Z.S.*

INTRODUCTION

From the Government Station at Kota Belud in British North Borneo on the Tampassuk plain a bridle path follows the Tampassuk, or Kadamayan River through open country to the Dusun village of Kiau 3,000 ft., at the foot of Mt. Kinabalu.

In the vicinity of Kiau the country has been largely denuded of its original forest, but above the patches of native cultivation the forest is unbroken up to about 9,000 ft. Between 6,000 ft. and 9,000 ft. the forest assumes a mossy character, a carpet of thick, green moss covering ground and trees alike. Above 9,000 ft. the character of the vegetation changes yet once again. The jungle is lower and this "low-sheltered forest" continues up to the tree limit at about 10,500 ft. Above the tree limit are the bare slopes of the granite core.

The base camp was established at Kiau 3,000 ft. The ascent to the summit was by way of the main spur running into the mountain from the south: Tenompak 4,700', Lumu Lumu 5,500', Kambo-rangah 7,200', and Pakka 10,200' are points on this spur. After the return to Kiau, the mountain was explored from another direction and camps were established on the north-western slopes at 3,300 ft. in the Kenokok Valley and at 5,000 ft. on the subsidiary Marei Parei spur.

Miss L. S. Gibbs,¹ one of Kinabalu's botanical investigators, zones the mountain as follows:—

1. *The secondary forest*, 2,500 ft.—4,000 ft.
2. *The primary high forest*, 3,500 ft.—6,000 ft. on the main spur and to about 5,000 ft.—5,500 ft. on lower spurs and ridges, but reaching a much higher altitude in the more sheltered valleys. Where the population is scarce, as for instance around the base of the northern ridge, the primary forest extends to a much lower level.

¹. Journal of the Linnean Soc., Botany, XLII, 1914, p. 49.

3. *The mossy forest.* On some spurs of the mountain found as low as 5,000 ft. It is frequently not continuous, occurs as high as 9,000 ft. and on the Marei Parei spur loses itself on the granite core at 8,000 ft.

4. *The scrub formation.* Found only on the disintegrating serpentine of the exposed ridges, as for instance on the Marei Parei spur at 5,000 ft—5,500 ft.

5. *The low sheltered forest.* 9,500 ft.—10,500 ft.

6. *The sub-summit dwarf forest.* } above 10,500 ft.

7. *The granite core.*

For the botanist this arrangement is perhaps more satisfactory than the broader divisions of Stapf:—

1. *The hill zone,* from the littoral zone of the coast up to 3,000 ft.

2. *The lower mountain zone,* 3,000 ft.—6,000 ft.

3. *The upper mountain zone,* 6,000 ft.—10,500 ft.

4. *The summit zone,* 10,500 ft.—13,455 ft.

Without going into a great amount of detail concerning the distribution of some invertebrate groups it seems that the distribution of animals can be very conveniently expressed in terms of Stapf's zones.

The area between Kīnabalu and the sea is largely cultivated land or secondary forest, but the effect of the comparatively recent artificial clearing on animal life is as yet not profound. The original lowland fauna of the region still persists in the isolated patches of primary jungle, usually situated on the higher ground. There has been an infiltration of certain species through the cultivated tracts into areas they probably would not occupy under normal conditions.

To the zoologist, therefore, no fundamental difference exists between the first two divisions of both authors, the first division containing the relics of the fauna of the second. Our division of the mountain into faunal zones is therefore:—

1. *The lowland zone.* The primary forest up to 3,000 ft. The fauna is probably identical with that of any area of old forest at sea-level in North Borneo. In Borneo montane and sub-montane forms occur commonly at 3,500 ft., less commonly at 3,000 ft. and normally never below the latter altitude. The lowland fauna is almost excluded at 4,000 ft. but wandering individuals are found

1. Trans. Linn. Soc. ser. 2, IV, 1894, pp. 69–263, pls. 11–20.

more commonly at higher altitudes than are stray examples of mountain species at low elevations. Animals are abundant in this zone.

2. *The mountain zone.* All the forest, high primary, mossy and low-sheltered up to the tree limit at about 10,500 ft. The mountain fauna may be said to commence at 3,000 ft. Most of its members are found throughout the whole zone, but it seems just possible to recognize two elements:—

- (a) *The lower mountain zone.* From 3,000 ft. to 6,000 ft. The zone of the high forest in which lowland species occur sporadically. Certain species of a peculiar sub-montane habitat are also characteristic of this division.

Animals are abundant.

- (b) *The higher mountain zone.* From 6,000 ft. to 10,500 ft. The vegetation above the primary high forest up to the tree limit. Lowland forms are completely excluded; sub-montane forms are rare and some true montane species shun the higher levels of this zone. A few species are found more commonly than at lower levels.

Animal life is less abundant.

3. *The summit zone.* Above 10,500'. The sub-summit dwarf vegetation above the true tree-level and the exposed granite core.

Life is scarce and the occurrence of vertebrates is casual.

Any such division as that indicated above must of course be arbitrary in nature, especially when considered in relation to the mobile animal groups. It must always be modified if it is accurately to express the condition prevailing in any one group of animals.

The faunal zones are possibly best marked in certain groups of insects, fairly obvious in birds and mammals, but less appreciable in reptiles and batrachians.

The following is a list of the collecting stations and their characteristics:—

Bhayan. 600 ft. (The lowland zone).

The collections made here are really not germane to the present paper. They are from the jungle which, except for isolated patches, is of secondary growth, near the halting-bungalow on the ridge-path.

Loung. 1,300 ft. (The lowland zone).

A very pleasantly situated Dusun village with a halting-bungalow, on the ridge-path leading to the mountain.

The surrounding country is largely cultivated but there are small areas of old jungle on the neighbouring hill-tops and in the deep gullies.

Koung was used purely as a halting place but it yielded a few specimens.

Kiau. 3,000 ft. (The lower mountain zone).

A Dusun village at the foot of the mountain. Although there is no old forest near the village, Kiau is a good collecting ground and the prevailing secondary growth and thin lines of primary forest wisely left by the Dusuns on the ridges and steep slopes produce both mountain and lowland forms.

The base camp was established at Kiau and specimens were collected there before and after the two ascents of the mountain, and also by a collector permanently stationed in the village in charge of stores.

Batrachians (16), lizards (19) and snakes (19) very common at this level.

(The number in brackets indicates the number of species obtained).

Kenokok. 3,300 ft. (The lower mountain zone).

An excellent collecting ground situated in very high old forest. The camp was in the Kenokok valley on the right bank of the stream which eventually joins the Kinataki River. Ten species of batrachians were collected by the aid of a lamp after dark within one hundred yards of the camp.

Lizards and snakes less common than at the lower level of Kiau and its environs.

Lobang. 4,000 ft. (The lower mountain zone).

A large overhanging rock on the left bank of the Kadamayn River surrounded by heavy jungle. Until the new and less steep way up the mountain (*via* Dallas, (halting bungalow) Tenompok and Lumu Lumu) was discovered the Lobang Cave was usually used by travellers for the first night's camp after leaving Kiau.

Lobang was not visited by any of the party but the old route was always used by the Dusun coolies on their way to and from the various camps and a few specimens collected by them during their short rests at Lobang are included in the collection.

Tenompok. 4,700 ft. (The lower mountain zone).

A patch of heavy forest left among the secondary growth on the lower slope of the main spur. A few specimens were collected here during a halt on the ascent.

Marei Parei. 5,000 ft. (The lower mountain zone).

A subsidiary spur of the mountain reached by crossing the ridge north of Kiau, various streams and finally the Kinataki River.

The camp here was in very open country—the “scrub formation” of Miss Gibbs—but there was jungle, bamboo in its upper regions, close at hand below the camp. This bleak, exposed place was a poor collecting ground for batrachians and reptiles.

Lumu Lumu. 5,500 ft. (The lower mountain zone).

The camp was in dense forest, tall but very mossy, on the main spur of the mountain.

A good collecting ground for frogs, but lizards and snakes scarce.

Kamborangah. 7,200 ft. (The higher mountain zone).

A ridge on the main spur of the mountain. The camp was in a mossy forest but this was lower and more scrubby than at Lumu Lumu.

From this camp *Natrix murudensis* was collected at 8,000 ft. the highest point at which a reptile was obtained. Only two snakes, both of the same species, were collected.

Pakka. 10,200 ft. (The higher mountain and summit zones).

The highest camp, made in a small cave formed by a large overhanging rock on the left bank of the Kadamayan River. From this camp the summit 13,455 ft. was visited once and the tree-limit on many occasions.

Collecting was carried out above the camp in the upper regions of the low mossy forest, in the low sheltered forest of the tree-limit and on the granite core above this. No batrachian recorded from above 10,300 ft. where only *Nectophryne altitudinis* was secured.

The three species of batrachians obtained were not conspicuously common and “frogging” with the lamp after dark was always unsuccessful. F. N. C.

PREFACE

The present report deals with some 600 specimens of amphibians and reptiles collected by Messrs. F. N. Chasen, Curator, Raffles Museum, Straits Settlements, and H. M. Pendlebury, Systematic Entomologist, Federated Malay States Museums, on Mt. Kina Balu, 13,455 ft. during April and May 1929. It is by far the most extensive collection yet made upon the mountain.

The paper is divided into three parts. The first is a list of the species arranged according to the altitudes at which they were collected. The number after the species-name is the number of specimens collected at that camp and it probably represents the abundance of the species at that altitude.

No reptiles were found above 8,000 feet and no amphibians above 10,300 feet. In comparison with this it may be recalled that on Mt. Korinchi in Sumatra which rises to a height of about 12,400 feet, no amphibians or reptiles were found above 7,500 feet.¹

Maps of the mountain and the position of the localities at which the different collections were made will be found in the Sarawak Museum Journal, II, p. 137 (1915), and Journ. Linn. Soc., Botany LXII, pl. 1 (1914). A third is given in this "Bulletin".

The second part of the article gives a detailed account of the collection in so far as the material obtained provides fresh information.

The following species are described as new:—

Amphibians. *Leptobranchella baluensis*, *Nectophryne altitudinis*, *Philautus amoenus*, *Ph. spiculatus*.

Reptiles. *Calamaria pendleburyi*, *Trimeresurus chaseni*.

The following changes are made:—

Phrynoglossus is revived as a genus and *Oreobatrachus* becomes a synonym of it.

Osteosternum becomes a synonym of *Ooeidozyga*.

* *Vide* Boulenger, Journ. Fed. Malay States Mus., VIII, Part 2, 1926, pp. 285—296, pl. VIII.

Korinchi Peak is a volcano and its upper areas are much less hospitable to herpetological life than those of Kinabalu which are much better watered. But I believe that the collecting of amphibians and reptiles was more systematically carried out on the latter than on Korinchi Peak.

It will be seen, however, that on Kinabalu reptiles become scarce at 7,200 ft.; only two examples of a snake were secured at Kamborangah—one of which, taken at 8,000 ft., was the highest reptile met with.

At or near Pakka (10,200 ft.) twelve amphibians of only three species were taken, all singly in daylight. Searches with lamps on two evenings produced no result.

A toad sitting in the sunlight at about 10,300 ft. is the altitudinal record for the mountain.

On Korinchi Peak the highest species secured (near the half-way camp at 7,300 ft.) were *Philautus cornutus* (Blgr.) and *Lophocalotes ludekingii* (Blkr.). C. B. K.

Nyctirax becomes a synonym of *Philautus*.

Philautus flavosignatus becomes a synonym of *Ph. margaritifera* and *Ph. anodon* of *Ph. pictus*. *Nyctirax robinsoni* becomes a synonym of *Ph. aurifasciatus*.

Lygosoma kinabaluensis is revived as a valid species.

Calamaria baluensis and *C. moultoni* become synonyms of *C. grabowskyi*.

A series of water-colour sketches by Mr. Chasen together with notes made by him at the time of collection, have enabled me to describe the living colours of a number of the species.

The third part of the article is a list of all the amphibians and reptiles that have been found upon the mountain from 3,000 feet upwards.

Mr. C. Boden Kloss, Director of Museums, Straits Settlements and Federated Malay States, has permitted me to retain for the British Museum of Natural History the types of the species here described, together with a representative series of specimens from the collection.

The Museum is also indebted to him for the types of the following species which until now have been kept in the Raffles Museum, Singapore:—

Gekko rhacophorus Blgr., *Stoliczkaia borneensis* Blgr., *Oreocalamus hanitschi* Blgr., *Cylindrophis lineatus* Blanford, and *Gymnodactylus sworderi* Smith.

Mr. Norman Smedley has pointed out to me that *Gekko rhacophorus* has all the generic characters of *Ptychozoon* except that they are not so markedly developed, and that it would be more correct to place it under the latter genus. I fully agree with this change and in Part III therefore have listed it under *Ptychozoon*.

PART I.

List of species arranged according to the altitudes at which they were collected.

Kiau, alt. 3,000 feet

AMPHIBIANS

Megophrys nasuta (Schlegel), 6; *M. gracilis* (Günther), 2; *Bufo leptopus* Günther, 11; *Sinromantis latopalmata* Blgr. 1; *Chaperina fusca* Mocquard, 2; *Rana macrodon* Dum. and Bib., 1; *R. kuhli* Dum. and Bib., 20; *R. palawanensis* Blgr., 3; *R. luctuosa* (Peters), 25; *R. nicobariensis* (Stoliczka), 1; *R. chalconota* (Stoliczka), 3; *R. jerboa* (Günther), 14; *R. whiteheadi* Blgr., 10; *Rana tuberilinguis* Blgr., 31; *Rhacophorus leucomystax* (Gravenh.), 33; *Philautus pictus* (Peters), 1.

LIZARDS

Gymnodactylus baluensis Mocq., 2; *Hemidactylus frenatus* Dum. and Bib., 5; *H. garnoti* Dum. and Bib., 1; *Hemiphyllodactylus typus* Blgr., 1; *Gekko monarchus* (Dum. and Bib.), 1; *Draco cornutus* Günther, 3; *D. obscurus* Blgr., 1; *D. fimbriatus* Kuhl, 1; *D. formosus* Blgr., 1; *D. quinquefasciatus* Gray, 1; *Gonocephalus borneensis* Schleg., 2; *Japalura nigrilabris* (Peters), 1; *J. ornata* Lidth, 2; *Calotes cristatellus* (Kuhl), 4; *Tropidophorus beccarii* (Peters), 5; *Mabuya multicarinata* (Gray), 3; *M. multifasciata* (Kuhl), 9; *Lygosoma nieuwenhuisi* Lidth, 2; *L. variegatum* Peters, 4.

SNAKES

Sibynophis geminatus (Boie), 2; *Zaocys fuscus* (Günther), 1; *Natrix saravacensis* (Günther), 1; *N. flavifrons* (Blgr.), 1; *N. chrysarga* (Schleg.), 6; *N. murudensis* M. A. Smith, 1; *Elaphe flavolineata* (Reinw.), 2; *Gongylosoma baliodeira* (Boie), 2; *Calamaria vermiformis* Dum. and Bib., 3; *C. leucogaster* Blgr., 1; *C. pendleburyi* M. A. Smith, 3; *Passerita prasina* (Boie), 1; *Psammodynastes pulverulentus* (Boie), 1; *Amblycephalus laevis* Boie, 1; *Bungarus flaviceps* Reinh., 1; *Naja naja mirolepis* Blgr., 3; *Maticora intestinalis* (Laur.), 4; *Trimeresurus gramineus* (Shaw), 6; *T. chaseni* M. A. Smith, 2.

Kenokok, alt. 3,300 feet

AMPHIBIANS

Bufo leptopus Günther, 20; *Chaperina fusca* Mocq., 1; *Rana kuhli* Dum. and Bib., 4; *R. jerboa* (Günther), 17; *R. whiteheadi* Blgr., 6; *Rana tuberculiguis* Blgr., 1; *Rhacophorus leucomystax* (Gravenh.), 1; *Rh. acutirostris* Mocq., 3; *Philautus petersi* (Blgr.), 4; *Ph. spiculatus* M. A. Smith, 1.

LIZARDS

Gymnodactylus baluensis Mocq., 1; *Japalura nigrilabris* (Peters), 2; *Calotes cristatellus* (Kuhl), 2; *Lygosoma variegatum* Peters, 1.

SNAKES

Trimeresurus gramineus (Shaw), 1.

Lobang, alt. 4,000 feet

AMPHIBIANS

Rana whiteheadi Blgr., 1; *Rhacophorus leucomystax* (Gravenh.), 1.

LIZARDS

Calotes cristatellus (Kuhl), 2; *Mabuya multicarinata* (Gray), 1.

SNAKES

Natrix saravacensis (Günther), 1; *N. chrysarga* (Schleg.), 1.

Tenompok, alt. 4,700 feet

AMPHIBIANS

Rana kuhli Dum. and Bib., 1.

LIZARDS

Japalura nigrilabris (Peters), 1.

SNAKES

Calamaria leucogaster Blkr., 2.

Marei Parei, alt. 5,000 feet

AMPHIBIANS

Megophrys monticola Kuhl and v. Hass., 1; *Philautus petersi* (Blgr.), 1; *Ph. mjobergi* M. A. Smith, 2.

LIZARDS

Lygosoma kinabaluensis Bartlett, 3.

SNAKES

Oreocalamus hanitschi Blgr., 1; *Amblycephalus laevis* Boie, 1.

Lumu Lumu, alt. 5,500 feet

AMPHIBIANS

Megophrys monticola Kuhl and v. Hass., 3; *M. hasseltii* (Tschudi), 6; *Bufo leptopus* Günther, 18; *Kalophrynus pleurostigma* S. Mull., 2; *Rana jerboa* (Günther), 5; *Philautus tuberilinguis* Blgr., 1; *Philautus pictus* (Peters), 2; *Ph. petersi* (Blgr.), 83.

LIZARDS

Gymnodactylus baluensis Mocq., 1; *Japalura nigrilabris* (Peters), 2; *Lygosoma kinabaluensis* Bartl., 1.

SNAKES

Natrix saravacensis (Günther), 1; *Calamaria vermiformis* Dum. and Bib., 1; *Trimeresurus sumatranus* (Raffles), 1.

Kamborangah, alt. 7,200 feet

AMPHIBIANS

Nectophryne altitudinis M. A. Smith, 1; *Megophrys gracilis* (Günther), 1; *Leptobranchella baluensis* M. A. Smith, 1; *Bufo leptopus* Günther, 12; *Nectophryne misera* Mocq., 14; *Kalophrynus pleurostigma* S. Mull., 1; *Rana kuhli* Dum. and Bib., 1; *R. jerboa* (Günther), 1; *Philautus petersi* (Blgr.), 12; *Ph. amoenus* M. A. Smith, 2; *Ph. mjobergi* M. A. Smith, 6.

LIZARDS

Gymnodactylus baluensis Mocq., 1; *Japalura nigrilabris* (Peters), 2; *Lygosoma kinabaluensis* Bartl., 1.

SNAKES

Natrix murudensis M. A. Smith, 2.

Pakka, alt. 10,200 feet

AMPHIBIANS

Nectophryne misera Mocq., 4; *N. altitudinis* M. A. Smith, 8;
Philautus mjobergi M. A. Smith, 1.

PART II.

Detailed account of the collection.

AMPHIBIANS

Megophrys monticola

Megophrys monticola Kuhl & v. Hasselt, Isis, 1822, p. 475.

Megophrys montana Kuhl in Ferussac, Bull. Sc. Nat. Paris, 1824, II.
p. 83.

Megalophrys montana, van Kampen, Amphib. Indo-Austral.
Archipel., 1923, p. 8.

~~Linnu Linnu~~ 3 ex., Marei Parei 1 ex.

I can see no reason for rejecting *monticola* as the correct name of the species usually known as *montana*. The reference to it in 1824 is nothing more than a French translation of the letter which had already appeared in 1822 except that the name *montana* is substituted for *monticola*. The description is slight, but the indications are sufficient "Kantige Kopfbildung und ein hohes membranoses Horn über jedem Auge", and subsequent authors have never disagreed as to what species was intended.

Megophrys gracilis

Kiau, 2 exs., Kamborangah, 1 ex.

Colours of the Kamborangah specimen in life. "Dark brown above, conspicuously banded darker on outer side of limbs. Ventrally, yellowish white on throat, chest and abdomen, tinged with red at the axilla. Waist and underside of hind-limbs crimson."

Leptobranchella baluensis, sp. nov.

Plate I, fig. 4.

A single specimen from Kamborangah.

Description of the type. Tongue not nicked behind; head as broad as long, snout broadly rounded, as long as the eye, not projecting beyond the lower jaw; nostril nearer the tip of the snout than the eye; canthus rostralis distinct; loreal region nearly vertical, feebly concave; interorbital space broader than upper eyelid; tympanum distinct, two-thirds the diameter of the eye and distant from it by half its own diameter. Fingers moderate, their tips dilated; first finger much shorter than second which is longer than

the fourth and considerably shorter than the third; a large inner carpal tubercle. Toes webbed at the base, their tips dilated like those of the fingers; fifth toe shorter than the third; no subarticular tubercles; a flat, inner metatarsal tubercle. The tibio-tarsal articulation reaches to the tip of the snout. Skin smooth except on the flanks where there are coarse granules; a fold from the eye to the shoulder.

Dark greyish-brown with blackish markings, namely a bar between the eye, a W-shaped mark on the shoulders and a \wedge -shaped one on the loins; sides of the head blackish and narrow black cross-bars on the limbs; below whitish, heavily peppered with dark brown.

From snout to vent 16 mm.

The following characters will serve to distinguish the two species now included in the genus.

Tongue feebly nicked behind; second and fourth fingers equal; loreal region oblique *mjobergi*.

Tongue not nicked behind; second finger longer than fourth; loreal region nearly oblique *baluensis*.

I have re-examined the types of the genus in comparison with this new species and feel convinced that the pupil in life is round and not vertical as originally stated (Journ. Sarawak Mus., III. 1925, p. 13). The generic description therefore should be amended on this point.

Bufo leptopus

Many specimens from Kiau, Kenokok, Kamborangah and Lumu Lumu.

The largest male measures 40 mm. from snout to vent; the largest female 64 mm.

The closely allied *Bufo penangensis* has been recorded from Kina Balu by Mocquard and there are specimens referred to *penangensis* in the British Museum collection obtained by Everett and Hanitsch. I have carefully compared these specimens with typical *penangensis* from Penang and the Malay Peninsula and with the large series of *B. leptopus* obtained by Messrs. Chasen and Pendlebury with the result that I refer all the Kina Balu material to *leptopus*. The degree of webbing of the toes is variable but is always less in *leptopus* than in *penangensis*. *B. leptopus* has also a longer leg, less warty skin, browner coloration, and grows to a larger size. *B. penangensis*, as far as I am aware does not exceed 37 mm. from snout to vent. Van Kampen gives 50 mm. but is possibly confusing it with *leptopus*.

The only published record of *penangensis* from Borneo is the one given from Kina Balu. There is however a single example from Bidi district, Sarawak, in the British Museum collection which I refer to this species.

Nectophryne misera

Many specimens from Kamborangah and four from Pakka (alt. 10,200 feet). With *Nectophryne altitudinis* it shares the honour of being the highest ranging amphibian upon the mountain. Mr. Chasen remarks of the colours in life. "Black; ventral tubercles usually white; sometimes marbled with large white blotches."

Nectophryne altitudinis, sp. nov.

Plate I, fig. 1.

Description of the type. Adult female, with ripe ova, collected at Pakka, alt. 10,200 feet.

Body moderately stout, limbs moderately slender. Head broader than long, snout rounded, a little longer than the eye, truncate in profile; canthus rostralis distinct; loreal region nearly vertical, concave; interorbital space broader than upper eyelid; tympanum distinct, two-thirds the diameter of the eye. Fingers obtuse at the tips; first finger a little shorter than second, the web between them extending half way up the digits; second finger shorter than fourth; outer three fingers webbed at the base; tips of toes obtuse like the fingers; third toe a little shorter than fifth; toes nearly fully webbed, the membrane reaching the tips of all except the fourth which has a membranous fringe along the last two phalanges; two flat metatarsal tubercles; no tarsal fold; the tarso-metatarsal articulation reaches to the shoulder.

Upper parts with small warty tubercles; belly and throat with small, flat rounded tubercles.

Blackish above, the vertebral region browner; flanks, throat and belly blackish, the latter uniform or with small yellowish or whitish spots; limbs yellowish-brown below.

From snout to vent 46 mm.

Variation. Seven more females were collected in the same locality as the type. They show the following variation. The head may be as long as broad; the tympanum only half the diameter of the eye. The tibio-tarsal articulation may reach a little beyond the shoulder; the third and fifth toes may be of equal length and the web between them more emarginate and not extend to the tips. In some individuals the yellow coloration of the thighs and arms extends on to the belly.

A single male specimen was collected at Kamborangah, alt. 7,200 feet. From snout to vent its length is 26 mm.

Nectophryne altitudinis is related to *N. guentheri* and *N. everetti*, from both of which it differs in the more truncate snout, the obtuse digital discs and in many other smaller characters. The first specimen captured was seen sitting in the morning sun at an altitude of about 10,300 feet. The eggs of this toad are few in number and large in size, the vitelline sphere measuring 3 mm. in

diameter. An examination of the stomach contents showed fragments of beetles and small crustacea among other things.

Phrynoglossus baluensis

Oreobatrachus baluensis, Boulenger, Ann Mag. Nat. Hist., (6) XVII, 1896, p. 401, pl. XVII; van Kampen, Amphib. Indo-Austral. Archipel., 1923, p. 229.

Oreobatrachus baluensis was described from a single individual obtained on Kina Balu by Dr. R. Hanitsch. The present collection contains 15 more specimens, all from Kiau, alt. 3,000 feet.

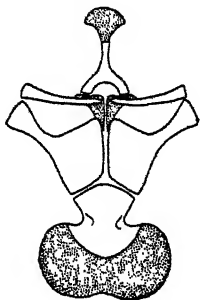
There is not much to add to the original description of the species. A slight tarsal fold is present and the tibio-tarsal articulation in many examples does not extend beyond the anterior border of the eye.

The dorsal coloration of most of the specimens is very dark grey, but two males are pale grey in colour with a broad dark vertebral band. Some have a pale brown splash upon the occiput.

Males are smaller than females. The largest male is 22 mm. from snout to vent, the largest female 33 mm.

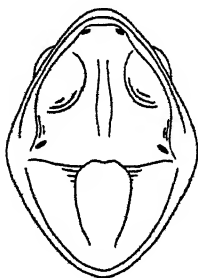
The male has a subgular vocal sac, the openings being by slits on the floor of the mouth mid-way between the tongue and the angle of the jaw. The eggs are strongly pigmented. They measure 2 mm. in diameter.

The genus *Oreobatrachus* has been distinguished from *Ooeidozyga* (*Oxyglossus* auct.) by the presence of a bony style to the sternum and a transverse dermal fold in front of the pharynx. No such fold however is to be found in the present series and an examination of the type specimen shews that it is a corrugation of the mucous membrane at that point and not a true dermal thickening.



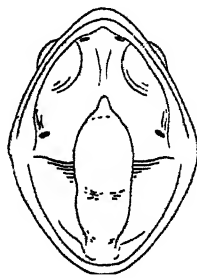
1

Sternal Apparatus of
Ooeizodyga.



2

Tongue of
Phrynoglossus.



3

Tongue of
Ooeidozyga.

The sternum has a bony style as stated, but so also has the sternum of *Ooeidozyga*. The generally accepted definition that this genus has a cartilaginous sternum is not correct, both *O. lima* and *O. laevis* having well developed bony styles. In some examples of *O. lima* the ossification is not very dense and the style might be missed if the sternal apparatus was not dissected out; in the stained preparation it is very clear.

The tongue of *O. lima* however differs so distinctly from that of the other members of the genus, that I propose to retain it in a genus by itself: the recently described *Osteosternum* will become a synonym of it. For the remaining species now placed under *Ooeidozyga* the name *Phrynoglossus* is available, with *Oreobatrachus* as one of its synonyms. The two genera will now stand as follows:—

Genus *Ooeidozyga*

Ooeidozyga Kuhl & v. Hasselt, Isis, 1822, p. 475—*Occidozyga* Kuhl in Bull. Sc. Nat. Geol. Paris, II, 1824, p. 83.—*Oxydozyga* Tschudi, Mem. Soc. Sc. Nat. Neuchatel, II, 1838, p. 85 (type *lima*).

Oxyglossus (not of Swainson 1828) Tschudi, Mem. Soc. Sc. Neuchatel, II, 1838, p. 85 (type *lima*).

Osteosternum Hsien Wen Wu, Contr. Biol. Lab. Sci. Soc. China. Nanking, V (2), 1929, p. 1 (type *amoyense*).

Tongue pointed and extensively free behind; no vomerine teeth; omosternum forked at the base; sternum with a bony style; tympanum hidden; digits pointed, toes extensively webbed.

Species. *Ooeidozyga lima* (Tschudi).

Genus *Phrynoglossus*

Phrynoglossus Peters, Monatsb. Akad. Berlin, 1867, p. 29 (type *martensi*).

Microdiscopus Peters, idem, 1877, p. 422, pl. (type *sumatranus*).

Oreobatrachus, Boulenger, Ann. Mag. Nat. Hist., (6) XVII, 1896, p. 40, pl. XVII (type *baluensis*).

Tongue rounded or feebly nicked behind, free in its posterior third only; no vomerine teeth; omosternum forked at the base; sternum with a bony style; tympanum hidden; digits with discs; toes webbed.

Species. *P. laevis* (Günther); *P. baluensis* (Boulenger); *P. semipalmatus* (M. A. Smith); *P. celebensis* (M. A. Smith); *P. floresiana* (Mertens).

Rana luctuosa

A large series was collected at Kiau. Three tadpoles obtained differ somewhat in coloration from the description. The basal half of the tail is mottled with black and yellow these markings then terminating abruptly leaving the distal half of the tail of a more or less uniform pale brownish colour.

Rana jerboa

Many specimens from Kiau, Kenokok, Lumu Lumu and Kamborangah. Two forms can be differentiated in this series.

One has a slightly narrower head and slightly longer leg. Its colour is brownish above, the hinder part of the thighs being marbled with dark brown and yellow. This form agrees with the typical one from Matang.

The other has a somewhat broader head and slightly shorter leg. In colour it is greyer and the back of the thighs are thickly powdered with dark brown upon a lighter ground. Intermediate examples however connect the two forms completely.

Rana whiteheadi

Colours in life. "Above dark green except hind limbs which are brownish. Head and trunk spotted with bright yellow. Under-side of trunk silvery white; limbs brownish".

Rana chalconota

Kabayau (at the foot of the mountain) 1 ex., Kiau, 2 exs. The Kabayo specimen in life was "brownish olive above, back of thighs reddish spotted with black. Belly Chinese-white, brown under the arms, reddish under the legs. Web of toes black".

Rana tuberilinguis

Staurois tuberilinguis, van Kampen, Amphib. Indo-Austral. Archipel., 1923, p. 237.

Thirty-one examples from Kiau, one from Kenokok, one from Lumu Lumu.

All agree in having a lingual tubercle and no vomerine teeth. The tibio-tarsal articulation reaches to the tip of the snout.

The colour in life of the specimen from Kenokok was "entirely bright green, paler below".

Simomantis latopalmata

A single male specimen from Kiau.

The vocal sacs appear externally as very distinct folds of skin on either side of the throat below the angle of the jaws. There is a grey nuptial asperity on the first finger. From snout to vent 46 mm.

Rhacophorus acutirostris

Three examples from Kenokok.

One in life was coloured "olive above; pale orange below. Flanks with irregular black patches; hind limbs mostly brown with dark brown patches." Another was "greyish olive above; whitish below. Flanks and thighs broadly blotched with bright yellow and black."

Rhacophorus pardalis

One specimen from Kabayau at the foot of the mountain, alt. 600 feet. Not previously recorded from Kina Balu.

The colours in life were as follows:—"Brown above, with irregular reddish and blackish markings; flanks yellow, spotted with black. Limbs light brown above, yellow on the inner aspects. Underparts dull yellow, webs geranium-pink."

Philautus amoenus, sp. nov.

Plate 1, fig. 3.

Description of the type. Female collected at Kamborangah. Head moderate, broader than long. Snout rounded, as long as the eye, not projecting beyond the lower jaw; nostril a little nearer the tip of the snout than the eye; canthus rostralis fairly distinct; loreal region oblique, feebly concave; inter-orbital space broader than upper eyelid; tympanum feebly distinct, one-third the diameter of the eye.

Fingers rather short, free, with large discs, those of the outer fingers being larger than the tympanum; first finger much shorter than second which is much shorter than fourth, third finger longer than the snout, twice as long as the second. Toes one-third webbed, their discs smaller than those of the fingers; third toe as long as the fifth; subarticular tubercles moderately developed, an indistinct flat inner metatarsal tubercle; the tibio-tarsal articulation reaches the eye. Skin of the upper parts smooth, of the throat and belly granular.

Very dark brown above with whitish (yellow in life) spots or markings more or less connected to each other and forming a definite pattern, namely an oval patch on the nape, an elongated one down the middle of the back and a band along either flank; a white bar between the eyes and white spots on the lips; limbs banded with dark brown and white. Below whitish, heavily powdered with brown.

From snout to vent 24 mm.

A second specimen, juvenile, from the type locality agrees well with the type, except that the markings upon the upper parts are less broken up and the under parts are dark brown with a few white spots.

Allied to *Ph. nijobergi* from which it differs in the shorter hind limb and very distinctly in colour pattern.

Philautus pictus

Ixalus pictus, Peters, Monatsber Akad. Berlin, 1871, p. 580.

Philautus pictus, van Kampen, Amphib. Indo-Austral. Archipel., 1923, p. 269 (terra typ. Sarawak, Borneo).

Rhacophorus anodon van Kampen, Weber's Zool. Ergebn. Leiden, IV, 1907, p. 400—*Philautus anodon*, van Kampen, Amphib. Indo-Austral. Archipel., 1923, p. 271 (terra typ. Kaju Tanem, Sumatra).

Kiau, 1 ex., Lumu Lumu, 2 exs.

The genus *Nyctixalus*, type *margaritifer*, was erected by Boulenger on a single male specimen in the possession of the Royal Museum of Brussels (Ann. Mag. Nat. Hist., (5) X, 1882, p. 35). It was said to have a vertical pupil. The specimen was purchased as being from the East Indies and unfortunately cannot now be found. Three years later however the British Museum collection acquired a male frog from Java which Dr. Boulenger identified as his *Nyctixalus margaritifer*. The pupils of this specimen are rather widely dilated but are certainly not vertical, and except for a slightly shorter leg and shorter web to the toes, this specimen agrees with the frogs collected on Kina Balu which I refer to *Philautus pictus*. The general habitus and colour pattern of this frog are unusual and characteristic and there is no reason to think that Boulenger was mistaken in identifying the Javan frog as his *N. margaritifer*. Moreover he later on suppressed Boettger's *Philautus flavosignatus* under his *N. margaritifer*, a fact which he recorded in his copy of Cat. Batr. Sal., 1882, but apparently did not publish.

The second species in the genus *Nyctixalus*, namely *N. robinsoni* (type locality, Tjibodas, Java), rests upon a single specimen which is in the Indian Museum, Calcutta; through the kindness of Dr. Prashad I have recently been able to examine it and have no hesitation in identifying it with *Philautus aurifasciatus* (Schlegel). The specimen is rather sodden but is otherwise in a good state of preservation. The pupils are diamond-shaped with the long axis horizontal.

Nyctixalus therefore agreeing in all generic characters with *Philautus* should become a synonym of it. My statement in van Kampen's Amphib. Indo-Austral. Archipel., 1923, p. 277 that *Nyctixalus* has no intercalary ossification is an error on my part.

To conclude the story *Philautus flavosignatus* (Peters) will become a synonym of *Philautus margaritifer* (Boulenger) and *Nyctixalus robinsoni* Annandale a synonym of *Philautus aurifasciatus* (Schlegel).

Whether *Ph. margaritifer* from Java should be considered distinct from *pictus* (Borneo, Sumatra and the Malay Peninsula) is doubtful, the character which separates them being only the extent of web to the toes. In the former this is at the base only, in the latter the toes are about one-third webbed. It would probably be more correct to regard the species as races.

Van Kampen has separated his *Ph. anodon* on account of its smooth skin and the skin being adherent to the skull. I find a smooth skin in a specimen of *pictus* from Kuching, Borneo (B. M. coll.) while the ossification of the skin over the fronto-parietal region appears to be an adult character and is present both in *pictus* and in *margaritifer*.

The males of *pictus* and of *margaritifer* are without vocal sacs.

***Philautus spiculatus*, sp. nov.**

Plate 1, fig. 2.

Description of the type. Head broader than long; snout obtusely pointed, as long as the eye; nostril nearer the tip of the snout than the eye; canthus rostralis distinct, curved; loreal region very oblique, concave; interorbital space broader than upper eyelid; tympanum distinct, half the diameter of the eye.

Fingers moderate, webbed at the base, with large discs, those of the outer fingers being as large as the tympanum; first finger much shorter than second which is much shorter than fourth; third finger longer than the snout, not twice as long as second. Toes half webbed, their discs smaller than those of the fingers; third toe as long as the fifth; subarticular tubercles moderately developed; an indistinct inner metatarsal tubercle. The tibio-tarsal articulation reaches well beyond the tip of the snout. Skin of the upper parts smooth, of the throat and belly coarsely granulate; a series of conical tubercles along the back of the arm, the flank, the back of the thigh and foot, one at the knee and one at the heel; a patch of rounded tubercles below the vent.

Greenish above with reddish patches; a dark W-shaped mark on the shoulders and dark transverse markings across the top of the head and snout; limbs with dark cross-bars, below white speckled with dark brown.

From snout to vent 30 mm.

A single female specimen from Kenokok.

Allied to *Ph. longicrus* and *Ph. jacobsoni*, from both of which it differs in the larger head and the conical tubercles along the limbs and body as well as in coloration.

Philautus petersi

Mr. Chasen remarks that it was the commonest amphibian upon the mountain. Its coloration and markings are as variable as they are in its Javan representative *Ph. aurifasciatus*.

The male has a large subgular vocal sac, the openings being on the floor of the mouth on either side near the angle of the jaw. The eggs in a female 30 mm. from snout to vent measure 3 mm. in diameter.

The largest male is 22 mm. from snout to vent, the largest female 33 mm.

Philautus mjobergi

Philautus mjobergi M. A. Smith, Journ. Sarawak Mus., III, 1925, p. 11, pl. I.

Ph. mjobergi was described from specimens obtained on Mt. Murud at 7,000 feet altitude. The present collection contains a single specimen from Marei Parei, 5,000 feet, 6 from Kamborangah, 7,200 feet, and one from Pakka at 10,200 feet altitude. They agree well with the Mt. Murud specimens, but their separation from some examples of *Ph. petersi* is not always easy owing to individual variation.

Kalophrynus pleurostigma

Kamborangah, 1 ex., Lumu Lumu, 2 exs.

The Kamborangah specimen has a bright axillary ocellus which is coloured like the usual inguinal one.

Kamborangah, 7,200 feet, is a remarkably high altitude for a species which is also found at sea level. The webbing of the toes in this individual is less than in other Bornean specimens, which have almost fully webbed feet, but in other respects it does not differ from them.

Chaperina fusca

Sphenophryne leucostigma, M. A. Smith, Journ. Sarawak Mus., III, 1925, p. 8.

Sphenophryne fusca, M. A. Smith, Bull. Raff. Mus., No. 3, 1930, p. 124.

Kiau, 2 exs., Kenokok, 1 ex.

In a paper now in course of preparation Mr. Parker has shewn that on the characters of the skull the genus *Chaperina* should be retained.

LIZARDS

Gymnodactylus baluensis

Kiau, 2 exs., Kenokok, 1 ex., Lumu Lumu, 1 ex., Kamborangah, 1 ex.

Three are males. They have 7, 9, and 9 preanal pores respectively, but no femoral, although some of the enlarged femoral scales shew pits.

The enlarged transverse subcaudal plates may be complete or divided into two.

Hemiphyllodactylus typus

A single specimen of this rare gecko was obtained at Kiau. It agrees well with Bleeker's description.

Draco cornutus

One male and two females from Kiau.

The patagium of the male is deep, dull red in colour, that of the female orange or greyish with the usual markings. The male gular sac is a little longer than the head and is covered with very small scales; it is lemon-yellow in colour and there is no indication that it was red in life as stated in the description. The female has a longitudinal fold on the throat, but there is no trace of any pouch.

Japalura ornata

Plate II, fig. 2.

Two adult male specimens from Kiau.

The rostral appendage is about as long as the eye-opening, it projects vertically upwards but is flaccid and can be bent in any direction. The oblique fold in front of the shoulder is barely indicated and there is no transverse gular fold. The limbs are very long and slender, the hind one reaching to well beyond the tip of the snout.

Colour. Light brownish above and below without any other evident markings.

The tail is broken in both examples, but another male in the British Museum collection measures, as follows:—Head and body 55, tail 115 mm.

Japalura nigrilabris

Kiau, 1 ex., Kenokok, 1 ex., Tenompok, 1 ex., Lumu Lumu, 1 ex., Kamborangah, 2 exs.

The Kenokok specimen was coloured in life as follows:—“Bright green above, freckled on the dorsum with black; greenish white below. Three orange spots on the upper lip and a few above the eyes and on the sides of the head. Throat broadly striped with orange. Four indistinct broken transverse bands on the body”.

Tropidophorus beccarii

Tropidophorus beccarii, M. A. Smith, Proc. Zool. Soc. London, 1923, p. 777 and Journ. Sarawak Mus., III, 1925, p. 13.

Four specimens from Kiau.

The number of scale-rows at mid-body is as follows:—

♂ 36; ♀ ♀ 36, 34, 32.

T. morquardi as I have pointed out in the references given above, should be regarded as a synonym of *T. beccarii*. The variation in the number of scale-rows in the species over its whole range is from 28 to 36. It is unlikely that the full variation will be found

in any one locality, each district having a limited variation (2 to 4 scales) together with slight differences in coloration. The character of the prefrontals, whether in contact with, or separated from, one another, and the number of loreals, whether one or two in a series, is of no value in this species.

The variation in the number of scale-rows in the British Museum collection is as follows:—

Kina Balu. ♂ 36, ♀ ♀ 36, 34, 32, 32.

Kina Balu. ♂ 36, ♀ ♀ 34 (types of *T. mocquardi*).

Matang, Sarawak. ♀ ♀ 30, 30.

Baram River, Sarawak. ♂ 28, ♀ 28.

Akar River, Sarawak. juv. 28.

Bidi, Sarawak. juv. 36.

Tropidophorus brookei

One example from Kabayo, near the foot of the mountain. It has not previously been recorded from the region of Kina Balu.

The variation in the number of scale-rows at mid-body, when more material is available, will probably be similar to that of *T. beccarii*.

The British Museum collection shews the following variation.

Kina Balu, ♂, 36; Sandakan, ♀ 36; Lawas, ♀ 34; Mt. Dulit, ♂, 32; Akar R., ♀, 34; Sarawak, ♀ 32, (type), ♂, 32. The Matang specimens recorded by me in Journ. Sarawak Mus., III, 1925, p. 13, were 30 and 32 respectively.

Lygosoma nieuwenhuisi

de Rooy, Rept. Indo-Austral. Archipel., I, 1915, p. 202.

Two examples from Kiau.

Previously known from a single specimen obtained at Long Bloe, in Northern Dutch Borneo.

The following details supplement the original description. 24 or 26 scales round the middle of the body, the vertebrals (2 to 4 rows) larger than the others. Distance between the end of the snout and the axilla $1\frac{1}{2}$ times in distance between the axilla and the groin. Twenty smooth lamellae under the fourth toe.

Colour in alcohol. Back light brownish-green with strong metallic gloss, and numerous scattered black spots and black edgings to most of the scales; base of tail above with black transverse bands; top of head browner than the back, the scales strongly outlined with black; below light steel bluish or greenish.

Head and body 72; tail 90 mm.

Lygosoma variegatum

Kiau, 4 exs.

The number of scale-rows at mid-body is 46, 46, 46 and 48 respectively, but owing to crowding and irregularity of the lateral scales an exact count is difficult. The number is slightly higher than has previously been recorded for *variegatum*, but I have no hesitation in referring these specimens to that species. Twelve examples from Borneo in the British Museum collection show the following variation:—Sarawak, 40, 40, 40, 44; Balingean, coast of Sarawak, 44, 46; Mt. Dulit, 44; Borneo (no definite locality) 40.

Bartlett (Croc. Liz. Borneo Sarawak Mus., 1895, p. 94) has given the living colours of this lizard, and as they are not usually known they may be repeated here. "Male. Above dull brown, marbled, and with two longitudinal rows of unequal sized spots down the back; chin, throat and breast deep cobalt-blue; paler blue on the chest and belly; under sides of fore-arms, vent and hind-legs, dirty yellow; under surface of tail, French-grey or bluish-grey. Female. Above like the male; chin and throat whitish; whole of under parts including limbs, bright yellow; under side of tail, bluish grey. She is the most beautiful of all the lizards found here. In old males, the cobalt blue of the throat is very brilliant."

Lygosoma kinabaluensis

Lygosoma Kinabaluensis Bartlett, Croc., Liz. Borneo, Sarawak, Mus., 1895, p. 96.

Marei Parei, 3 exs., Lumu Lumu, 1 ex., Kamborangah, 1 ex.

Lygosoma kinabaluensis was briefly described by Bartlett as being "similar to *L. variegatum*, but the back mottled and without striations and without a distinct dorso-lateral band. This small species is quite distinct, therefore I name it to distinguish it from the others at present, until I can procure more specimens. Being a spirit specimen I am unable to give decided colours. Kina Balu. N. Borneo (G. D. Haviland)." De Rooy has referred it, with a query, to the synonymy of *L. variegatum*. Fortunately the type is still available and through the kindness of Mr. Banks, Curator of the Sarawak Museum, it has now been presented to the British Museum.¹

¹ Mr. E. Banks informs me that the types of the following species described by Bartlett are no longer in the Museum collection, nor are they even listed in the Reptile Catalogue started by Bartlett's successor Mr. Shelford: A List of the Reptiles of Borneo, Journ. Straits Branch, R. Asiat. Soc., No. 35, 1901, pp. 43—68.

In Croc. Liz. Borneo, Sarawak Mus., 1895, pp. 73—96: *Draco affinis*, *D. nigriappendiculatus*, *D. grandis*, *Mabuia Lewisi*, *M. rubricollis*, *M. sarawacensis*. In Note Book of Sarawak, 1895, p. 42: *Trionyx pecki*.

All these species have been sunk by de Rooy in Reptiles of the Indo-Australian Archipelago, I, 1915, either with or without a query, and presumably without having seen the types.

The specimen is in an extremely bad state of preservation and much faded, but sufficient remains to identify it without much hesitation with the five skinks collected by Messrs. Chasen and Pendlebury. As stated by Bartlett they are quite distinct from *variegatum*. The following description is drawn up from the six specimens.

Distance between the end of the snout and the fore-limb once and a half times in distance between the axilla and groin. Snout obtusely pointed; lower eye-lid scaly; ear opening without lobules, nearly as large as the eye-opening.

Rostral convex, in good contact with the fronto-nasal which is considerably broader than long; no supranasals; nostril in the nasal; prefrontals in contact with one another or separated by a small shield; frontal shorter than the frontoparietal and interparietal together; six or seven supraoculars, the first three in contact with the frontal; parietals in suture behind the interparietal; no nuchals; two superposed anterior loreals; seven supralabials, the fifth below the middle of the eye.

Thirty-four to 38 smooth scales round the middle of the body, laterals a little smaller than the dorsals or ventrals.

Limbs well developed; the hind-limb reaches the fingers or the wrist of the adpressed fore-limb; 15 to 17 lamellae beneath the fourth toe.

Dark brown above, the back with small yellow spots which are more crowded along the sides; upper half of flank black with numerous yellow spots; limbs brown above spotted with yellow; labials with black sutures; whitish below, the throat uniform or spotted with black.

Length of head and body 51; tail 67 mm.

Most nearly related to *L. variegatum* from which it differs in the fewer scales round the body, fewer digital lamellae, shorter limbs and colour pattern. Possibly a high altitude derivative of *L. variegatum*.

SNAKES

Sibynophis geminatus

Two specimens from Kiau.

The largest, a female, has a total length of 900 mm., tail 365. This is much longer than any previously recorded, but there is a specimen in the British Museum collection, also from Kina Balu, which is almost as long.

Natrix murudensis

Natrix murudensis M. A. Smith, J. Sarawak Mus., III, 1925, p. 5.

Originally described from two specimens obtained on Mt. Murud at 5,500—6,000 feet altitude. Messrs. Chasen and Pendlebury obtained three more, two at Kamborangah (one at an altitude of 8,000 feet) and one at Kiau. The following details will supplement my original remarks, and an excellent coloured sketch of the snake by Mr. Chasen enables me to describe the colours of the living creature.

Internasals as long as or a little shorter than the prefrontals; frontal longer than broad, as long as its distance from the end of the snout; anterior sublinguals shorter than the posterior.*

Olive brown above with a more or less distinct dorsal series of black spots or short cross-bars and a dorso-lateral series of small yellow spots on the middle and hinder part of the body and tail. Neck vermillion above with black spots arranged quincuncially; lips vermillion. Belly pale greyish, with a longitudinal series of small black spots best marked towards the outer margins of the ventrals.

The ventral and subcaudal counts of the five examples now known stands as follows:—

- ♂, V. 178; c. 96. Kina Balu.
- ♂, V. 179; c. 95. „
- ♀, V. 187; c. 89. „
- ♀, V. 176; c. 83. Mt. Murud.
- ♀, V. 179; ? „

Oreocalamus hanitschi

Oreocalamus hanitschi, Boulenger, Ann. Mag. Nat. Hist., (7) IV, 1899, p. 452; Hanitsch, J. Straits Br. Roy. Asiat. Soc., 1900, p. 72 and pl. I, fig. 3; de Rooij, Sn. Indo-Austral. Archipel., 1917, p. 141, fig.

A single male specimen from Marei Parei.

The type and only previously known specimen, also a male, was obtained by Dr. R. Hanitsch on Kina Balu at 4,200 feet altitude. It is now considerably bleached, but in other characters the second example agrees well with it. As the original description is probably not readily accessible to all and as De Rooij's description contains a bad clerical error, I have drawn up a new one based on the two specimens.

*The original description stating the reverse is a slip.

Maxillary teeth 11, subequal. Snout pointed; rostral as broad as high, the portion visible above being about as long as the internasals which are half the length of the prefrontals; frontal longer than broad, longer than its distance from the end of the snout, shorter than the parietals; nostril close to the rostral, between a small nasal and the first labial; loreal longer than high, its lower border forming an angle, wedged in between the second and third labials; one pre- and one postocular; temporals 1 + 2; eight supralabials, fourth and fifth touching the eye, the seventh the largest; four lower labials in contact with the anterior sublinguals which are longer than the posterior. Scales quite smooth, in 17-17-17 rows; ventrals 127-132; anal entire; subcaudals 26-28 pairs.

Blackish above and on the outer ends of the ventral shields; yellowish below, uniform or with a few scattered brown dots; tail with a dark median streak.

Total length 570; tail 80 mm.

Calamaria vermiformis

Kiau 2 ♀♀, ventrals 168, 171; subcaudals 17, 18; 1 ♂, v. 160; c. 23. Lumu Lumu, 1 ♂, v. 179; c. 16.

The two females (adults) are uniform brown above, the outer two scale-rows being dirty whitish. The ventrals are white with black transverse bars, occupying usually two scales, and sometimes incomplete. The male from Kiau, a juvenile, is very dark brown above with narrow transverse bars formed of small white spots; the head is light brown, paler at the sides. Below it is coloured like the females. This colour pattern is a juvenile one only, the white dorsal bars disappearing and the head becoming darker, with age.

The adult specimens represent the most common colour form and the most widely distributed one. A rarer colour form is one in which the dark ventral bars increase in size and may occupy the whole of the ventral surface. More rarely still the bars are entirely absent.

The specimen from Lumu Lumu (adult) is black above, the lateral margins of each scale being white (yellow in life) thus forming series of white longitudinal lines; the belly is uniform white. This colour pattern, but with the dark ventral bars added is represented in the British Museum collection by five specimens from Fort de Kock, West coast of Sumatra.

***Calamaria pendleburyi*, sp. nov.**

Description of the type. Adult female.

Diameter of the eye one and a half times as great as its distance from the mouth; rostral broader than high; frontal one and a half times as long as broad, not twice as broad as the supraocular.

shorter than the parietals; one pre- and one postocular; five upper labials, third and fourth touching the eye, fifth much the longest, twice as long as the fourth; mental in contact with the anterior sublinguals which are in contact with the first three infralabials; posterior sublinguals in contact with one another. Scales in 13 rows. Ventrals 146; anal single; subcaudals 19 pairs.

Dark brown above, the colour extending to the outer margins of the ventral shields, but interrupted by a white line through the middle of the outermost row of scales; white below. Upper lip white; tail with a dark median line.

Three specimens examined, all from Kiau.

In one, a male, the eye is equal to its distance from the mouth. The scale counts are as follows:—

♀	ventrals	147;	subcaudals	19.	Type.
♀	„	146;	„	17.	Paratype.
♂	„	133;	„	20.	„

C. pendleburyi is closely allied to *C. stahlknechti* from Nias and Sumatra and *C. indragirica* also from Sumatra. It differs from both in the longer mental shield, the longer fifth labial, fewer ventral shields and in colour pattern. Dr. Roux has kindly compared one of my specimens with the type of *indragirica* and there are topotypes from Nias of *stahlknechti* in the British Museum of Natural History for comparison.

[I take this opportunity to point out that *Calamaria baluensis* Boulenger and *C. moultoni* Dunn are in my opinion identical with *C. grabowskyi* Fischer. I have compared the types and only known specimens of the two first named, both in the British Museum collection, with paratypes of *C. grabowskyi*, also in the same collection, and with the exception of slight differences in the proportions of the rostral and frontal shields I can find no character to separate them.

In colour pattern the three forms are identical. I count the ventral shields of *C. moultoni* to be 168. Dunn evidently made them 172, and 122 as given in his description is a typographical error.]

Naja naja mialepis

Three specimens from Kiau. Scales in 21 or 23 rows on the neck, 17 at mid-body.

Maticora intestinalis

Four examples from Kiau. All belong to the colour form *nigrotaeniatus*.

Trimeresurus chaseni, sp. nov.

Plate II, fig. 1.

Two specimens from Kiau, one adult and one half grown.

Description of the type. Adult male. Snout moderate; eye very small, its distance from the mouth twice its own diameter; rostral a little broader than high; upper head scales large, subimbricate, obtusely keeled, four or five in a transverse series between the supraoculars which are very large; snout bordered above by five large scales, namely, three internasals, and one on either side between them and the eye; six supralabials, second below but not bordering the loreal pit, third highest and separated from the eye by two rows of small scales. Ten and eleven infralabials; a single pair of elongated sublinguals.

Scales in 19.19.15 rows, the median rows strongly keeled anteriorly, feebly keeled posteriorly. Ventrals 143; anal entire; subcaudals 20 pairs. Tail not prehensile.

Brownish above with irregular blackish, light edged blotches which posteriorly become transverse bands. Yellowish below heavily powdered with grey; an oblique black stripe behind the eye bordered below with white.

Total length 645 mm.; tail 45 mm.

The paratype does not differ in any important particular from the type. Being immature its markings are more clearly defined. Ventrals 130; subcaudals 20 pairs, tail not quite complete. It is a female.

Trimeresurus chaseni is most closely related to *T. monticola*, from which it differs in the number of scale-rows, the fewer infralabials and several other smaller characters. *T. monticola* has been recorded from Sumatra (Boulenger, Fauna Malay Pen., 1912, p. 216) but I am unable to find the authority on which this statement is based. Otherwise it is known only from continental Asia.

Trimeresurus sumatranus

One male example from Lumu Lumu. It differs from the recognized description in having only 19 scale-rows and slightly fewer ventrals, but in other respects resembles typical *sumatranus*.

Six interoculars, eight and nine supralabials; scale-rows 19-19-13; ventrals 173; subcaudals 64. Total length 1,220; tail 195 mm.

Green above, the top of the head and fore-part of the body heavily marked with black, this colour becoming scarcer posteriorly and forming indistinct transverse bands. Scales on sides of head, ventrals and subcaudals heavily margined with black. Upper surface of tail red.

Trimeresurus gramineus

Kiau, 6 exs., Kenokok, 1 ex.

All have 21 scale-rows at mid-body.

PART III.

List of the species known to inhabit Mt. Kina Balu above 3,000 feet.

*Those marked with an asterisk have not been recorded before from the mountain.

AMPHIBIANS

**Megophrys monticola* Kuhl and v. Hass.

„ *nasuta* (Schlegel).

„ *hasseltii* (Tschudi).

* „ *gracilis* (Günther).

„ *baluensis* (Boulenger).

**Leptobrachella baluensis* M. A. Smith.

Nectophryne misera Mocquard.

„ *everetti* Boulenger.

„ *maculata* Mocquard.

* „ *altitudinis* M. A. Smith.

Bufo leptopus Günther.

„ *spinulifer* Mocquard.

„ *asper* Gravenhorst.

„ *biporcatus* Gravenhorst.

**Kalophrynus pleurostigma* Tschudi.

**Chaperina fusca* Mocquard.

Phrynoglossus baluensis (Boulenger).

**Rana macrodon* Dum. and Bib.

„ *kuhli* Dum. and Bib.

„ *palawanensis* Boulenger.

„ *luctuosa* (Peters).

* „ *jerboa* (Günther).

„ *whiteheadi* Boulenger.

„ *cavitympanum* Boulenger.

„ *everetti* Boulenger.

* „ *chalconota* (Schlegel).

* „ *nicobariensis* (Stoliczka).

„ *tuberilinguis* Boulenger.

„ *guttatus* (Günther).

Cornufer baluensis Boulenger.

Simomantis latopalmatus (Boulenger).

Rhacophorus leucomystax (Gravenhorst).

„ *macroscelis* Boulenger.

„ *acutirostris* Mocquard.

* „ *pardalis* Günther.

* *Philautus pictus* (Peters).

„ *petersi* (Boulenger).

* „ *amoenus* M. A. Smith.

* „ *spiculatus* M. A. Smith.

* „ *mjobergi* M. A. Smith.

LIZARDS

Gymnodactylus marmoratus (Kuhl).

„ *baluensis* Mocquard.

* *Hemidactylus frenatus* Dum. and Bib.

„ *garnoti* Dum. and Bib.

Peropus mutilatus Wiegmann.

* *Hemphyllodactylus typus* Bleeker.

* *Gekko monarchus* Dum. and Bib.

Ptychozoon rhacophorus (Boulenger).

Draco cornutus Günther.

* „ *fimbriatus* Kuhl.

„ *maximus* Boulenger.

* „ *quinquefasciatus* Gray.

* „ *formosus* Boulenger.

„ *obscurus* Boulenger.

* *Gonocephalus borneensis* (Schlegel).

Japalura ornata Lidth.

„ *nigrilabris* (Peters).

Calotes cristatellus (Kuhl).

Mabuya multicarinata (Gray).

„ *multifasciata* (Kuhl).

Lygosoma tenuiculum Mocquard.

„ *variegatum* Peters.

* „ *kinabaluensis* Bartlett.

* „ *nieuwenhuisi* Lidth.

„ *olivaceum* (Gray).

„ *bowringii* (Günther).

Tropidophorus beccarii (Peters).

SNAKES

- Stoliczkaia borneensis* Boulenger.
Opisthotropis typica (Mocquard).
Sibynophis geminatus (Boie).
 * *Zaocys fuscus* (Günther).
Natrix trianguligerus (Boie).
 „ *saravacensis* (Günther).
 „ *flavifrons* (Boulenger).
 „ *chrysarga* (Schlegel).
 „ *maculatus* (Edeling).
 * „ *murudensis* M. A. Smith.
 * *Elaphe erythrura* (Schlegel).
Lycodon albofuscus (Dum. and Bib.).
Oligodon purpurascens (Schlegel).
 „ *octolineatus* (Schneider).
 „ *everetti* (Boulenger).
 „ *vertebralis* (Günther).
Hydrablades praefrontalis (Mocquard).
Gongylosoma baliodeirum (Boie).
Gongylosoma baliodeira (Boie).
Oreocalamus hanitschi (Boulenger).
Calamaria vermiformis Dum. and Bib.
 „ *grabowskyi* Fisher.
 „ *leucogaster* Bleeker.
 „ *bicolor* Dum. and B.b.
 * „ *pendleburyi* M. A. Smith.
 „ *brachyura* Boulenger.
 „ *lateralis* Mocquard.
Psammodynastes pulverulentus (Boie).
 * *Passerita prasina* Boie.
Bungarus flaviceps Reinhardt.
Naja naja miolepis Boulenger.
Maticora intestinalis (Laurenti).
Amblycephalus laevis Boie.
 * *Trimeresurus sumatranus* (Raffles).
 * „ *chasei* M. A. Smith.
 * „ *gramineus* (Shaw).

EXPLANATION OF PLATES

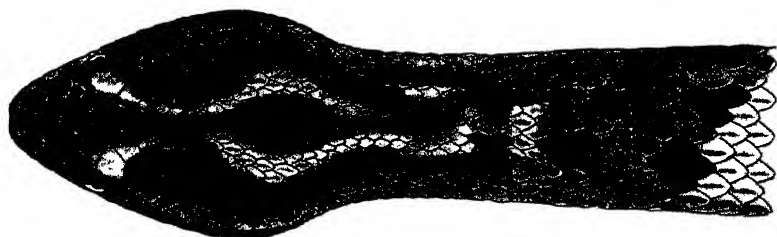
- Pl. I, fig. 1. *Nectophryne altitudinis* M. A. Smith.
 „ „ 2. *Philautus spiculosus* M. A. Smith.
 „ „ 3. *Philautus amoenus* M. A. Smith.
 „ „ 4. *Leptobranchella baluensis* M. A. Smith.
 Pl. II, fig. 1. *Trimeresurus chasei* M. A. Smith.
 „ „ 2. *Jalapura ornata* Lidth de Jeude.



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John Bale, Soria & Dazielson, [18] London.

1. *Nectophryne altitudinis* M. A. Smith.
2. *Philautus spiculosus* M. A. Smith.
3. *Philautus amoenus* M. A. Smith.
4. *Leptobranchella baluensis* M. A. Smith.



2.



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John Bale Sons & Danielsson, Ltd London

1. *Trimeresurus chaseni* M. A. Smith.
2. *Jalapura ornata* Lidth de Jeude.

On a Collection of Polychaeta in the Raffles Museum, Singapore

By C. C. A. MONRO, M. A.

(with 12 text-figures)

(Published by permission of the Trustees of the British Museum)

This report was made at the request of the authorities of the Raffles Museum, who very kindly entrusted me with their collection of *Polychaeta*. The great majority of the specimens are from the neighbourhood of Singapore; a few are from the Malay Archipelago and the China Sea.

There are no new species or varieties. I have however been able to give an account of the heteronereids of *Perinereis singaporiensis*, *Perinereis nancaurica* and *Perinereis cultrifera*, var. *perspicillata*, all of which are new to science. Moreover I have extended the range of *Pseudonereis variegata* from the Atlantic to the Indian Ocean.

LIST OF SPECIES

Amphinomidae

Chloeia flava (Pallas).

Chloeia flava, var. *tumida* Baird.

Eurythoe complanata (Pallas).

Polynoidae

Iphione muricata (Savigny).

Phyllodocidae

Eulalia magalhaensis Kinberg.

Phyllodoce quadraticeps Grube.

Nereidae

Perinereis singaporiensis Grube.

Perinereis nancaurica (Ehlers).

Perinereis nuntia var. *brevicirris* Grube.

Perinereis cultrifera var. *perspicillata* Grube.

Pseudonereis variegata (Grube).

Leonnates jousseaumei Gravier.

Eunicidae

Eunice aphroditois (Pallas).

Marphysa mossambica Peters.

Lysidice collaris Grube.

Sabellidae

Sabellastarte indica (Savigny).

EXPLANATION OF THE FIGURES

I. *Perinereis singaporiensis*.

- A. Twentieth foot.
- B. Sixth foot of epitocous male.
- C. Modified foot of epitocous male.

2. *Perinereis nancaurica*.

- A. Head and proboscis from above.
- B. Head and proboscis from below.
- C. Twentieth foot.
- D. Posterior foot.
- E. Third foot of epitocous male.
- F. Modified foot of epitocous male.

3. *Perinereis cultrifera* var *perspicillata*.

- A. Modified foot of epitocous male.
- B. Modified foot of epitocous female.

4. *Leonnates jousseaumei*.

- A. Anterior foot.

THE COLLECTION

Family **Amphinomidae**

***Chloeia flava* (Pallas).**

McIntosh, 1885, p. 8, pl. III, figs. 1—3 and pl. IA, figs. 7—9.

Fauvel, 1917, p. 190.

Monro, 1924, p. 71.

Occurrence:—"Pulau Sambu, near Singapore and Tanjong Rhu, Singapore, 1896." (1).

Remarks:—The bottle with the above locality-label contained this specimen and three colourless examples of *Chloeia*: I am unable to say from which of the two places referred to the present specimen was collected. It measures 83 mm. by 18 mm. at the widest part without the feet. The tips of the bristles are tinged with yellow and there is a row of median dorsal purple spots. Both in this specimen and in the colourless examples the lateral spur of the serrated dorsal bristles appears to be smaller and less distinct behind about the 15th chaetiger than it is more anteriorly.

Chloeia flava, var. **tumida** Baird.

Chloeia tumida, Baird, 1868, p. 232, pl. IV, fig. 7a—d.

Fauvel, 1917, p. 191.

Occurrence:—Pulau Sambu, near Singapore and Tanjong Rhu, Singapore, 1896. (3).

Singapore, 1906. (1).

Remarks:—All these specimens are colourless. The largest measures 110 mm. by 15 mm. at the widest part without the feet. The one marked Singapore, 1906 is pale brown and the remainder are a milk-white. I have examined Baird's type and in my opinion the subterminal enlargement of the dorsal bristles recorded by Baird and Fauvel is an artifact. It may be present or absent from bristles of the same foot. On the other hand I am inclined to believe that the absence of colour is a character of the animal in life and is not due to fading and the action of the preservative. The British Museum collection contains a number of examples of *C. flava* which have been preserved in spirit for more than fifty years and still retain their purple markings. It would of course be more satisfactory if we had collector's notes on the colour of these animals in life. Moreover if my assumption that we are dealing with a colourless variety of *C. flava* is true, I do not know whether they constitute a local race or if their occurrence is sporadic and they should be classed as a form.

Eurythoe complanata (Pallas).

Eurythoe alcyonia. Gravier, 1901, pp. 248—254, pl. 9, figs. 140—143; pl. 10, figs. 144—146.

Occurrence:—Pulau Renggis near Blakang Mati, Singapore. 29.9.30. (1). 13.10.30. (6).

Family **Polynoidae****Iphione muricata** (Savigny).

Gravier, 1901, p. 226, pl. 9, figs. 129 and 130.

Occurrence:—Pulau Renggis near Blakang Mati, Singapore. 13.10.30. (1).

Sultan Shoal Light House. (1).

Remarks:—I think that the specimens from New Caledonia described by Pruvot (1930, p. 3) as belonging to this species are probably examples of *I. ovata* Kinberg, for Pruvot writes:—"Les bords (des élytres) sont entièrement dépourvus de franges".

Family **Phyllodocidae**

***Eulalia magalhaensis* Kinberg.**

Fauvel, 1919, p. 364, fig. 3, with synonymy.

Occurrence:—Telok Berhala, Pulau Aor, China Sea. $3^{\circ} 19' N.$, $103^{\circ} 41' E.$

Remarks:—A single specimen measuring 80 mm. by 2 mm. The colour is dark green with a pale transverse band across the middle of each segment. The ventral cirrus of the second segment is compressed but not bordered. There is only one specimen and I have not been able to ascertain the distribution of the bristles and acicula in the tentacular segments. The latter are distinctly separated.

With the material at my disposal I have no means of judging whether Fauvel is justified in uniting the tropical *Eulalia tenax* Grube, with which *Pterocirrus ceylonicus* Michaelsen is probably identical, with the southern and Antarctic *E. magalhaensis*. Both Bergstrom and Augener regard them as distinct.

I have compared the present specimen with some examples of Kinberg's species from South Georgia. The latter are a more or less uniform brown in colour and lack the light transverse segmental band. Moreover they have cream-coloured probosces, whereas the proboscis of the example from the China Sea is dark green. Furthermore the head and especially the eyes of the tropical specimen are relatively smaller than those of the examples from South Georgia. In the shape and arrangement of the tentacular cirri, of the feet and of the bristles they are very similar. On the crucial question of the tentacular formula in the two forms I can throw no light.

***Phyllodoce quadraticeps* Grube.**

Gravier, 1900, p. 198, pl. X, figs. 22—24. Text figs. 56—60.

Fauvel, 1930, p. 511.

Occurrence:—Sipora Island, off West Sumatra; (10).

Remarks:—The average measurements of these specimens is about 240 mm. by 2 mm. The species has a wide Indo-Pacific distribution.

Family **Nereidae**

***Perinereis singaporiensis* Grube.**

Pruvot, 1930, p. 55, pl. III, figs 62—64. Textfig. 5.

Occurrence:—Pulau Renggis, near Blakang Mati, Singapore. 29.9.30. (I). 13.10.30. (II).

Remarks:—Pruvot has given a careful account of this species. The average size is about 80 mm. by 3 mm. at the widest part without the feet. In some of the specimens the colouring has not completely disappeared. The back in the anterior part of the body is dark grey with an almost black longitudinal median dorsal stripe. The pigment is interrupted between the segments by rather wide bands without colour. I figure a 20th foot (Fig. 1, a.) for purposes of comparison with that of the allied *P. nancaurica* (Ehlers).

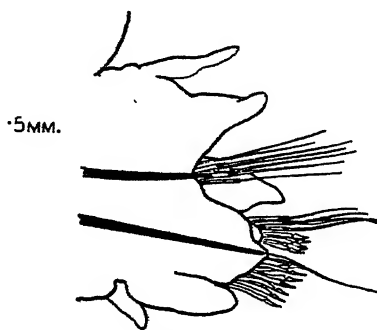


Fig. 1. a.

One specimen is beginning to show signs of sexual modification. It is a male and shows certain differences in colour. Dorsally it is colourless for about the first seven chaetigers. Then a median longitudinal dark brown stripe appears which gradually widens out so that the colour is diffused over the whole dorsal surface. At about the 15th chaetiger the dorsal stripe divides into two, thus leaving a median colourless band down the middle of the back. By about the 60th chaetiger all the pigment has disappeared.



Fig. 1. b.

The cirri of the first seven chaetigers (Fig. 1, b.) are slightly thickened; from the 8th to the 19th chaetiger the feet resemble

those of the atocous form: the 20th and succeeding feet (Fig. 1c)

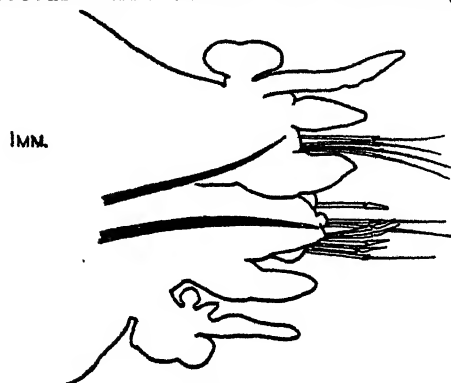


Fig. 1. c.

are modified except for the bristles. There are no swimming bristles developed. The details of the modified feet are given in the figure.

***Perinereis nancaurica* (Ehlers).**

Nereis (Perinereis) nancaurica, Augener, 1922, p. 23.

Occurrence:—Pulau Renggis, near Blakang Mati, Singapore. 29.9.30. (1). 13.10.30. (9).

Remarks:—This species, which seems to occur together with *P. singaporiensis*, and, if the present collection is a true sample, in almost equal numbers, has an average length of about 80 mm. and a breadth of 3 mm. at the widest part excluding the feet. As in *P. singaporiensis*, there is a dark median dorsal stripe in the anterior segments, but the general pigmentation of the back is not so dark as in Grube's species, nor are the intersegmental interruptions of the colour pattern so wide. The longer of the tentacular cirri are relatively a little shorter than in *P. singaporiensis*, reaching to the second chaetiger when laid along the back, whereas in Grube's species they reach to about the 4th chaetiger. The general

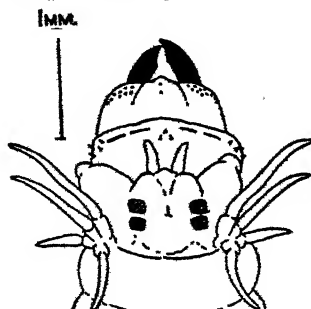


Fig. 2. a.



Fig. 2. b.

arrangement of the paragnaths (Fig. 2, a. and b.) is very similar

in the two species. In *P. nancaurica* however there are 3 paragnaths in V; there are in VII and VIII a number of very small paragnaths absent in *P. singaporiensis*, and all the paragnaths of the maxillary ring are noticeably smaller than in Grube's species. moreover there are no distinct teeth on the jaw-plates, the cutting

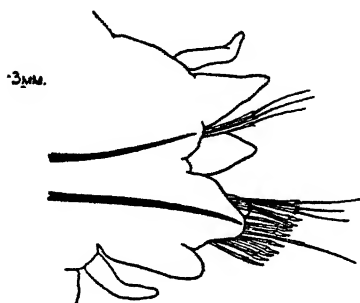


Fig. 2. c.

edges being serrated rather than denticulated. The feet (Fig. 2, c.) in the anterior and middle segments have a short dorsal cirrus of about the same length as the conical upper dorsal lamella, a lower dorsal lamella shorter than the upper, a ventral lamella which is considerably shorter than the rather prominent ventral chaeta-sac and a ventral cirrus that does not reach to the end of the ventral lamella.



Fig. 2. d.

In the posterior feet (Fig. 2, d.) the increase in size in the upper dorsal lamella is slight and the pedal gland is seen as a small dark patch. In *P. singaporiensis* in the posterior feet the increase in size in the upper dorsal lamella is much greater and the black pedal gland is very conspicuous.

The structure and arrangement of the bristles appear to be indistinguishable from those of *P. singaporiensis*. The dorsal ramus has homogomph spinigers, the upper ventral ramus has homogomph spinigers and heterogomph falcigers, and the lower ventral ramus has heterogomph spinigers and heterogomph falcigers. The hairs of the blades of the falcigers are perhaps continued a little further up towards the apex than they are in Grube's species.

One specimen, a male, shows signs of sexual modification. For the first ten chaetigers the back is pale brown in colour; at about the 11th chaetiger a median white longitudinal stripe appears. This widens from before backwards, so that at about the 20th chaetiger the pigment is confined to a pair of dark patches in each segment above the feet. At about the 80th chaetiger the pigment

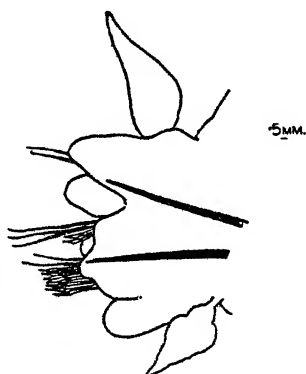


Fig. 2. e.

disappears. The cirri of the first seven chaetigers (Fig. 2, e.) are considerably thickened. The modified feet begin at the 16th chaetiger, but no swimming bristles are developed. I figure a modified foot (Fig. 2, f.).



Fig. 2. f.

Perinereis aibuhitensis (Grube) is very close to this species, but according to Horst (1924, p. 169) there are falcigers in the notopodium. *Perinereis horsti* Gravier I am inclined to regard at the most as a variety of the present species. In a previous publication I have discussed the history of the specific name *nancaurica*.

***Perinereis nuntia* var. *brevicirris* Grube.**

Fauvel, 1919, p. 417, with synonymy.

Occurrence:—Siglap, Singapore, 15.10.30. (13); Pulau Renggis, near Blakang Mati, Singapore, 29.9.30. (1)?

Remarks:—I have nothing to add to Fauvel's comprehensive study of Savigny's *Perinereis nuntia* and its varieties.

***Perinereis cultrifera* var. *perspicillata*, Grube.**

Perinereis perspicillata, Grube, 1878, p. 90, pl. IV, fig. 10.

Occurrence:—Telok Berhala, Pulau Aor, China Sea, 3° 19' N, 103° 41' E. (7); Pulau Renggis, near Blakang Mati, Singapore (4).

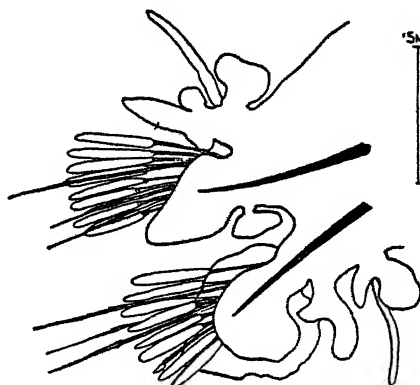
Remarks:—Of those species allied to *Perinereis cultrifera*, which were described by Grube from the Philippines, *P. perspicillata* is distinguished by having a triangular group of three rather large paragnaths in V and a group of 4 to 8 paragnaths in I. Fauvel (1930, p. 527) regards it as a synonym of *P. cultrifera*. A study of the epitocous forms has however led me to treat it as deserving of at least a varietal status. Of the four specimens from Pulau Renggis one is a large atocous example measuring 70 mm. by 3 mm. at the widest part for about 90 chaetigers. Of the other three two are epitocous females and one an epitocous male. The larger of the two females measures 25 mm. by 2 mm. at the widest part for about 65 chaetigers, and the epitocous male is of about the same size.

I have no suggestion to account for the fact that these smaller specimens are epitocous while the large specimen remains unmodified.

In all the epitocous specimens the pigment has largely disappeared from the head and the eyes have increased greatly in size. Moreover in the part of the body in which the feet are modified there is a pair of small round black spots in every segment above the feet.

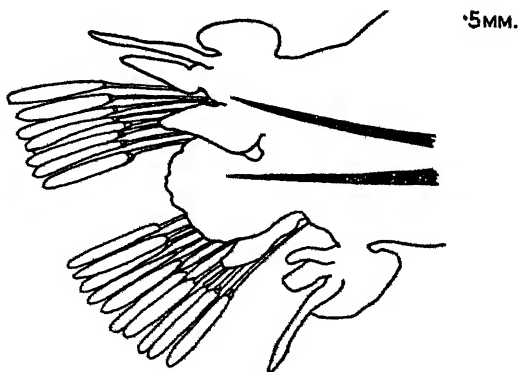
In the male the dorsal cirri of the first six chaetigers are thickened and the epitocous feet begin at the 15th chaetiger. In addition to swimming bristles there are a few normal bristles remaining in the feet. Unfortunately the condition of the pygidium

renders it useless for purposes of comparison. I figure a modified foot, (Fig. 3, *a*.) which may however be somewhat distorted owing to the condition of the specimen.

Fig. 3. *a*.

In the females the dorsal cirri of the first five chaetigers are thickened and the epitocous feet begin at the 18th chaetiger.

The normal bristles have disappeared. I figure a modified foot of an epitocous female (Fig. 3, *b*.). Here again the possibility of

Fig. 3. *b*.

distortion is not eliminated, as the specimen is in bad condition. In *P. cultrifera*, in both male and female heteronereids the modified feet begin at the 19th to 20th chaetigers. I, therefore, cannot agree with Fauvel that the present form is identical with *P. cultrifera*.

***Pseudonereis variegata* (Grube).**

Nereis variegata, Ehlers, 1901, p. 112, pl. XIV, figs. 1—21; with synonymy.

Pseudonereis ferox Fauvel, 1914, p. 120, pl. VII, figs. 13—17.

Occurrence:—Telok Teloran, Pulau Aor, China Sea. (4).

Remarks:—There is nothing I can add to the numerous accounts of this well characterised species. *Pseudonereis trimaculata* Horst (1924, p. 187) is very probably a synonym of this species. My specimens however lack the black spots on the feet which he records. With the possible exception of Horst's description, I believe this to be the first record of this species from the Indian Ocean. *Pseudonereis anomala* Gravier appears to be the common Pacific representative of the genus.

***Leonnates jousseaumei* Gravier.**

Gravier, 1901, pl. XI, figs. 34—37, figs. 162—165.

Fauvel, 1919, p. 400.

Horst, 1924, p. 150.

Fauvel, 1930, A, p. 18.

Occurrence:—Pulau Renggis, near Blakang Mati, Singapore. (1). Off East Coast of Malay Peninsula. 34 fms. (1).

Remarks:—The paragnaths of the maxillary ring are imperfectly corneous, and there appears to be no sulcus interrupting the bands of papillae in the mid-ventral line of the oral ring, so that these are absent from Group V only.

The notopodia of the anterior feet (Fig. 4, *a*.) have spinigerous bristles only, for the falcigers do not appear in the dorsal ramus before the middle of the body.

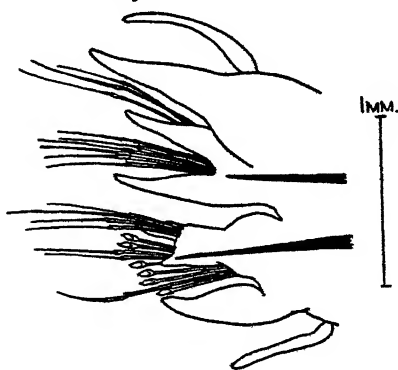


Fig. 4. *a*.

One of the present specimens is from the type locality of *Leonnates indicus*, Kinberg. Unfortunately Kinberg's description is insufficient for recognition.

I think it possible that both Kinberg's species and *Leonnates virgata* Grube may be identical with *L. jousseaumei*.

The chief difference between Grube's and Gravier's descriptions lies in the fact that Grube's species is figured with papillae instead of paragnaths in Group IV of the oral ring. The paragnaths of the maxillary ring are in the present specimens imperfectly corneous, and there is probably variation in the extent to which they are hardened. In other respects there is little to distinguish the two species.

Family Eunicidae

Eunice aphroditois (Pallas).

Fauvel, 1917, p. 215, pl. VII, with synonymy; 1930, p. 533.

Occurrence.—Blakang Mati, Singapore, 1896, (1); Blakang Mati, Singapore, 4.1.1897, (1); Singapore, 1897, (1).

Remarks.—The specimen dated 1896 is a magnificent example of this species. It measures 80 cms. by 2 cms. without the feet. The pygidium is damaged; otherwise it is complete.

The specimen dated 4-1-1897 is an anterior fragment measuring 43.5 cms. by 2 cms.

The specimen dated 1897 is much smaller and also incomplete; it measures 23 cms. by 1 cm.

These specimens illustrate Fauvel's contention that in the larger and older examples the acicular chaetae occur further back in the body than in the younger specimens.

The example measuring 80 cms. in length has about 330 chaetigers and the acicular chaetae do not appear before the 212th chaetiger. Moreover, at the 210th chaetiger a sudden change occurs in the shape of the body.

The segments appear much shorter and the whole posterior region seems greatly contracted. The last 120 chaetigers have a length of 17 cms., less than a quarter of the total length of the specimen. The contracted posterior region may be a regenerated area.

The specimen measuring 43.5 cms. in length has the acicular chaetae beginning at the 148th chaetiger. It has 212 segments in all.

The specimen measuring 23 cms. in length, has a total of 165 chaetigers and the acicular chaetae begin at the 55th chaetiger. In this specimen as in the very large example there is a sudden change in the length and degree of contraction of the segments; this occurs at the 140th chaetiger and here again may mark a regenerated area.

Nothing is to be gained by re-opening the discussion as to the relation of this species to *E. roussaei*: Fauvel has gone into this matter at length.

Marphysa mossambica, Peters.

Fauvel, 1917, p. 232, fig. 22, with synonymy.

Occurrence:—Jugra, Selangor, F. M. S.; 1892 (2), 1897 (2); Pulau Renggis, Blakang Mati, Singapore, 13-10-30. (10).

Remarks:—This species is characterised by the absence of compound bristles in all but the anterior segments.

Lysidice collaris, Grube.

Fauvel, 1917, p. 236; 1930, p. 539, with synonymy.

Occurrence:—Pulau Renggis, near Blakang Mati, Singapore, 29-9-30. (1), 13-10-30. (5).

Family **Sabellidae**

Sabellastarte indica (Savigny).

Fauvel, 1930, p. 555, with synonymy.

Occurrence:—Singapore, 1897. (1).

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On some Reptiles and a Frog from the Natuna Islands

By N. SMEDLEY, M. A.

The Natuna Islands, lying as they do between the Malay Peninsula and Borneo, are notable for the predominance of a Bornean element in their fauna.¹ The following short list, although it contains a few species new to the Natunas, only makes additions which were to be expected in the circumstances.

A few of the specimens are of special interest in that they differ in some degree from the material available to me for comparison: some of these differences may be correlated with habitat, but I doubt if the examination of a long range of specimens would prove them worthy of nominal distinction.

There is a tendency towards larger size in the island forms, a fact probably due to an exceptionally favourable biological environment; it is unlikely that this denotes racial distinction.

Variation in colour may indicate new geographical races, but no satisfactory conclusions can be drawn without long series of each species drawn from many localities.

¹ Mr. L. Harrison notes as follows (Report Austr. Assn. Advancement of Science XVIII, 1928, p. 353) "On the basis of its frog fauna, Great Natuna [Bungurun Id.] is almost entirely Bornean, with an endemic genus of Pelobatids. The endemism of its land planarians is so remarkable that van Graff includes it among the eight or nine islands of the [Malay] Archipelago which he compares. But Molengraaff's reconstruction of past history would place it to the west of his great river system draining into the China Sea from Borneo and the Malay Peninsula [*i.e.* would make it Malayan *vide* The Geographical Journal, LVII, 1921, p. 103, fig. 2] so that it should belong to the latter and not to the former." C. B. K.

The specimens listed here were collected by Mr. F. N. Chasen of the Raffles Museum, in September 1928, and his field-notes on the specimens are incorporated. I am indebted to Dr. Malcolm Smith for comparing the more variable specimens with material in the British Museum. All the species concerned are recorded in de Rooij's "Reptiles of the Indo-Australian Archipelago," and I have therefore avoided the repetition of reference lists. The only previous faunal list of reptiles and Amphibia from these islands is that of Günther (Nov. Zool., II, 1895, pp. 499—502).

REPTILIA

Lacertilia

***Draco cornutus* Gthr.**

Bunguran Id., 2 ♂. Not previously recorded from the Natuna Islands. Originally described from Borneo; now known also from Sumatra and the Sulu Archipelago.

The gular sac of the male has hitherto been described as red. In specimens from Borneo in the collections of the British Museum examined by Dr. Smith the whole of the gular sac is yellow. The Natuna specimens have a gular sac which is tipped with bright lemon yellow, and notes on this point taken by Mr. Chasen from the fresh specimens confirm the examination of the spirit material. The original reference to a red coloration is probably an error.

***Draco fimbriatus* Kuhl.**

Bunguran Id., 2 ♂.

The larger of these has a head and body length of 110 mm., tail 175 mm. The black spots are not confined to the underside, but are profuse on the dorsal surface. This condition also obtains in most of the specimens, from various localities, in the Raffles Museum collection and is probably the normal coloration rather than the exception.

***Draco formosus* Blgr.**

Bunguran Id., 1 ♂. Not previously known from the Natunas.

Agrees well with a specimen in the British Museum from Kelantan except for the darker patagium. It is, however, much more strongly marked than any of the specimens in the Raffles Museum, which have generally only faint, small spots on the head and nape.

The Natuna specimen has a strong black marbling on the head and nape, the spots on the neck and body tending to form bands. The patagium is so dark as practically to obscure the usual bands, and this dark pigmentation probably accounts for the apparent

absence of the crimson edging to the membranes, which is not discernible even when the extended membrane is held against the light. The underside of the throat and wattles, usually a bright crimson, is also almost black. Melanism appears to be a common phenomenon in island forms.

***Draco melanopogon* Blgr.**

Bunguran Id., 1 ♀.

***Aphaniotis fusca* (Peters).**

Bunguran Id., 1 ♂. The head-scales are very variable, a fact which is considered by Swarder (Journal, Malayan Branch, Royal Asiatic Society, VII, 1929, pp. 327—335) to have a bearing on geographical races.

***Calotes cristatellus* (Kuhl).**

Bunguran Id., 1 ♂.

***Mabuya multifasciata* (Kuhl).**

Bunguran Id., 1 ♀.

Ophidia

***Boiga drapiezii* (Boie).**

Bunguran Id. Not previously known from the Natunas.

This specimen appears to be the largest yet recorded, with a total length of 1935 mm.; tail 468 mm. Ventrals 285 (previous maximum 276); sub-caudals 150. It exhibits a melanism similar to that often found in *Boiga cynodon*. The true coloration is present, but is partially masked by a black pigmentation consisting of minute specks lending a veiled effect.

Chelonia

***Dogania subplana* (Geoffr.).**

Bunguran Id.

AMPHIBIA

***Rana glandulosa* Blgr.**

Bunguran Id. Not previously known from the Natunas.

The colour of this specimen in spirit is greyish marbled with black; hindlimbs with dark cross-bars speckled behind. The warts on the back are large and very flat.

Notes on Some Malaysian Snakes

By N. SMEDLEY, M. A.

***Typhlops braminus* (Daud.).**

An example taken on Singapore Island on the 18th July, 1930, is provisionally referred to this species. It differs from the description and other specimens in the collection of the Raffles Museum in having the nasals incompletely divided, the cleft just failing to reach the rostral; the anterior nasal is in contact with the first and second labials inferiorly (the nasal cleft arises from the 2nd labial). The whole head, not merely the snout, is white in spirit, as are the anus and the tip of the tail. The colours in life were:—“Head pink; body purplish brown”. Several species of *Typhlops* are recorded as having the head, anal region and tail whitish; it is probable that all such records were made from preserved specimens and that they were pink in life. Total length, 230 mm. The greatest length previously recorded for *T. braminus* is 175 mm.

***Typhlops diardi nigroalbus* D. & B.**

A specimen of this snake, from Kuala Lumpur, Selangor, kept in captivity in the Raffles Museum, exhibits characteristics not unlike those of *Cylindrophis rufus*. Like that species, it can depress the body, and when touched will often raise the tail rather than the head; it will frequently emerge from its burrow tail first.

The head is pinkish-white. The posterior part of the body is marked with very fine oblique streaks giving the appearance of cracks in the skin. (Observed on a freshly-moulted specimen). This specimen later escaped and was dead when found. It exhibited curious post-mortem changes in coloration. The upper surface was no longer the usual iridescent blue-grey, but a dirty black. The oblique markings were visible throughout the length as greyish stripes continuous round the body. On the white ventral surface they had the appearance of pencil-markings. A similar pigmentation emphasised the sutures between the scales of the head. Total length, 420 mm. Previously recorded up to 360 mm.

***Cylindrophis rufus* (Laur.).**

I recently had the opportunity of examining a young specimen, in the collection of Mr. A. St. Alban Smith, since despatched to the Zoological Gardens in London. The crossbands on the dorsal surface were bright vermilion in colour.

***Dryocalamus subannulatus* (D. & B.).**

The Raffles Museum collection includes a specimen, collected on Siberut, Mentawi Islands, in 1924, which Dr. Smith appears inadvertently to have omitted from his list.¹ He had labelled it "*Dryocalamus annularis*". It agrees in every way with the description and other specimens except in size; it has a total length of 520 mm., tail 127 mm. Boulenger (Fauna Malay Pen., Rept. and Batr., p. 135) gives these measurements as 295 mm. and 170² mm. respectively. The snake was previously known from the Malay Peninsula, Singapore and Sumatra.

***Gongylosoma longicauda* (Peters).**

A specimen in the Raffles Museum from Lawas, Borneo, collected by Mr. A. Everett, exceeds the maximum length previously recorded for the species. It has a total length of 480 mm., tail 190 mm. It shows the five light lines anteriorly, agreeing with the description given by de Rooij,³ and not three only as in that of Boulenger.⁴

The anterior sub-linguals are shorter than the posterior.

***Macrocalamus lateralis* Gthr.**

Mr. M. R. Henderson of the Botanic Gardens, Singapore, recently obtained a specimen of this snake on Cameron's Highlands, Federated Malay States. It had a total length of 380 mm., as against a previously recorded maximum of 300 mm.

***Pseudorabdion longiceps* (Cantor).**

Examination of twenty specimens in the collection of the Raffles Museum, with scale counts of all but two badly damaged specimens, one from Singapore and one from Pulau Aor, shows that the sexual variation noted by Sworder (Singapore Nat., I, Pt. 2, 1922, p. 65) holds good for snakes from the Malay Peninsula, Singapore, the Rhio Archipelago and Sumatra. The range of variation is greater than hitherto recorded; my counts of Singapore specimens do not agree exactly with Sworder's figures.

	<i>Ventrals</i>	<i>Sub-caudals</i>
Males	... 130—141	25—31
Females	... 143—151	18—23

The yellow collar and the yellowish spot above the angle of the mouth vary with the individual without reference to sex.

¹. Ann. and Mag. Nat. Hist., (9), XVIII, 1926, p. 76.

². Evidently a misprint for "70".

³. Rept. Indo-Australian Arch. II, 140.

⁴. Cat. Snakes, II, p. 284 and Fauna Mal. Pen., p. 152.

Pseudoxenodon macrops (Blyth).

Mr. Henderson also obtained from Cameron's Highlands a snake which appeared to me to belong to the genus *Natrix*, but was unlike any species known to me. Dr. Malcolm Smith determined it as *Pseudoxenodon macrops*. A specimen taken in Perak many years ago was referred to this species by Dr. Boulenger, but on later examination Dr. Smith decided that it was not that species, but *Natrix chrysarga*. Mr. Henderson's specimen is therefore the first of this species to be recorded from the Peninsula.

Natrix petersi* (Blgr.)

Previously known from Sumatra and Borneo only, this species has recently been obtained in the Malay Peninsula by Mr. S. J. Ludgater at Tampin, Negri Sembilan. Mr. Ludgater's specimen is considerably larger than any yet recorded, the length of the head and body being 380 mm.; the tail, which is incomplete, measures 55 mm. Ventrals 140, subcaudals 26; it is a male. The specimen agrees well with de Rooij's description and with the type-specimen from Borneo in the British Museum collection. The only difference is a slight one of coloration, where, due no doubt to age, the black edging to the ventral scales has disappeared except at the outer margins.

The position of *Natrix petersi* in my key to the genus (Bull. Raffles Mus. No. 3, 1930, p. 42), is after *V. trianguligera*.

The following is a description of the species:—

Maxillary teeth 30--32, the posterior ones gradually enlarged. Eye moderate; rostral just visible from above; internasals truncate anteriorly, nearly or quite as long as the prefrontals; frontal once and a third times as long as broad, as long as its distance from the rostral or the end of the snout, shorter than the parietals; loreal higher than long; one pre- and three or four postoculars; temporals 2+2 or 3; nine supralabials the fourth, fifth and sixth touching the eye; five infralabials in contact with the anterior pair of sublinguals, which are shorter than the posterior pair. Scales in 19 rows, all more or less strongly keeled; ventrals 140—150; anal divided; subcaudals 65—78.

Brown above, with small black dots regularly arranged dorsally; a larger series of lateral black spots between which the scales are red in life, head dark olive, vermiculated with black, labials yellowish, with black sutures; yellow below, the shields edged with black or with the black confined to the outer margins.

Head and body 380; tail 120 mm.

Range. Sumatra; Borneo; the Malay Peninsula.

*Communicated by Dr. Malcolm A. Smith. The specimen is in the British Museum.

Natrix maculata (Edel.).

A specimen of *Natrix maculata* collected in the Kuantan district of Pahang by Mr. G. B. Purvis, Govt. Veterinary Surgeon, Raub, has only 138 ventral shields and 93 sub-caudals; the previous minimum counts were 140 and 95 respectively.

Calamaria gimletti Blgr.

Calamaria gimletti, Boulenger, Ann. and Mag. Nat. Hist., (7), XV, 1905, p. 456 and Fauna Malay Pen., 1912, p. 220; Sworder, Journ. Malayan Br. Roy. Asiat. Soc. VII, 1929, p. 337; Smith, Bull. Raffles Mus., 3, 1930, p. 59 (and Smedley, footnote).

Calamaria javanica, (nec Boulenger, Ann. and Mag. Nat. Hist., (6), VII, 1891, p. 279) Wall, Rec. Ind. Mus., XXII, 1921, p. 729 (Johore).

Mr. G. H. Sworder recently pointed out to me in correspondence that the specimen of *Calamaria gimletti* which he recorded from Fraser's Hill falls under *C. javanica* Blgr.; by the description of that snake given by Dr. Malcolm Smith in his recent work on Peninsular Reptiles. I thereupon looked into the question and conclude as follows:—

Boulenger, in his original description of *Calamaria javanica*, says "mental in contact with anterior chin shields". This is confirmed in the Catalogue of Snakes and by de Rooij, who examined the type¹.

Wall's specimen from Johore has the first infralabials in contact, thus separating the mental from the chin-shields.

According to the original descriptions, the posterior chin-shields are separated in *javanica*, but in contact in the case of *gimletti*, and in the specimen which Wall recorded as *javanica*.

In spite of the low ventral counts of Wall's and Sworder's specimens, they cannot therefore be *C. javanica*, which should be deleted from the Peninsular list.

Dr. Smith has since examined both these specimens and agrees that Sworder's specimen should be regarded as *gimletti*. Wall's specimen, which was in bad condition, he says "is certainly not *javanica* and appears to be *pavimentata*." *C. pavimentata* has also the first infralabials in contact with one another, and posterior chin-shields in contact. It differs from *gimletti* and *javanica* in the presence of a preocular, which, according to Wall, is lacking in his specimen.

¹ Reptiles of the Indo-Australian Arch. II, 1917, p. 176.

Dr. Smith has examined examples of this rare snake collected at Tampin, Negri Sembilan, by Mr. S. J. Ludgater. He gives (in litt.) the ventral and subcaudal counts as follows:—

	V.	Sc.		V.	Sc.
♂	207	17	♀	218	11
♂	200	16	♀	229	12
♂	203	17	♀	226	9

***Enhydris punctata* (Gray).**

Phytolopsis punctata Gray, Cat. Sn. 1849, p. 68.

Hypsirhina punctata, Boulenger, Cat. Sn. III, 1896, p. 12; de Rooij, Indo-Australian Reptiles, II, 1917, p. 184.

The Raffles Museum possesses five immature specimens from Kemaman, Trengganu, East Coast of the Malay Peninsula, taken in 1893 by Dr. Johnston. All five examples have only 23 scale-rows, but agree in other respects with the description. They were identified in 1898 by Dr. G. A. Boulenger who, however, failed to include them in his Fauna of the Malay Peninsula. The species is mentioned by de Rooij as occurring in the Malay Peninsula, but no reference is given to the source of her information. Smith does not refer to the species, but there seems to be little doubt that it must be added to the Peninsular list; it occurs also in Sumatra, Banka and Borneo.

***Hipistes hydrinus* (Cant.).**

A specimen of unknown origin in the Raffles Museum spirit collection has a total length of 590 mm., and must have measured considerably more when fresh. It has six lower labials in contact with the anterior sub-linguals on the left side, five on the right.

***Amblycephalus carinatus* Boie.**

Amblycephalus carinatus Boie, Isis, 1828, p. 1035; Boulenger, Cat. Sn. Brit. Mus., III, 1896, p. 445; M. A. Smith, Journ. N. H. S. Siam, II, 1916, p. 163; de Rooij, Rept. Indo-Austr. Arch. II, 1917, p. 277.

Paras berdmorei, (part), Theobald, Cat. Rept. Asiat. Soc. Mus., 1868, p. 63.

Amblycephalus carina'us hananus, M. A. Smith, Journ. N. H. S. Siam, VI, 1923, p. 204.

Amblycephalus carina'us berdmorei, M. A. Smith, Bull. Raffles Mus., 3, 1930, p. 88.

The first authentic record of this snake in the Malay Peninsula is that of Hanitsch (List of the Birds, Reptiles and Amphibians in the Raffles Museum, Singapore, corrected up to Dec. 1912); the next that of Smith (1930). Smith's division into sub-species

(1923) is based on the assumption that de Rooij's figures give the range of variation for specimens from the Archipelago only; this is not the case. In any event there is no line of demarcation between the two supposed forms.

The Raffles Museum possesses a specimen from the Dindings, Malay Peninsula, taken in 1902 by Mr. R. J. Wilkinson: total length, 522 mm., tail 110 mm.; ventrals, 181; sub-caudals, 77. There are also two smaller specimens from Java.

***Aipysurus eydouxi* (Gray).**

A specimen in the Raffles Museum has a total length of 670 mm. It is thus much bigger than the usual limit of size (550 mm. according to Smith, Monograph of the Sea-Snakes, 1926), but not so big as the female from Semarang, Java, recorded by the same author as having a total length of 910 mm.

This example, which appears to be a female, was taken near Singapore in 1906.

Oviparity in a Sea-Snake, *Laticauda colubrina* (Schneid)

By N. SMEDLEY, M. A.

(with one text figure)

Under the above heading I recently (1) recorded an apparent case of oviparity in one of six Sea-Snakes kept in captivity in the Raffles Museum. As all Sea-Snakes of the family *Hydrophiidae* have been definitely stated to be viviparous (2) observations have been made on this species and are here set down.

Six snakes were kept in a tank containing sea-water. Eggs were laid as follows; it should be noted that they were usually observed in the morning on opening the Museum and had been laid overnight. The date given is that on which they were observed.

5-6-30.—Six eggs. Two taken out for examination, the remainder left in the water. The two eggs measured 80 mm. x 25 mm. and 68 mm. x 27 mm. The shell was less hard and leathery than that of most land-snakes, but was tough and thick although the yolk and germinal disc were visible through it. On 11th June, two

more eggs were taken out; they measured 74 mm. x 25 mm. and 72 mm. x 25 mm. A photograph of the latter (fig. 1) was taken and the eggs replaced.

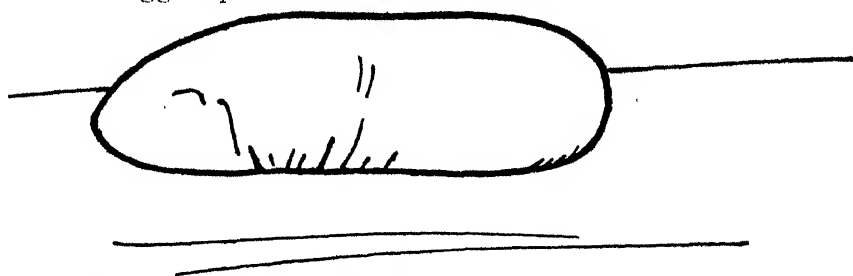


Fig. 1. Egg of *Laticauda colubrina*. About natural size. (From a Photograph).

16-6-30.—Another egg, 71 mm. x 22 mm. was seen. As no outline of the yolk was visible the egg was opened and found to contain a thin milky fluid with broken cream coloured yolk particles. This egg was infertile. The snake which was believed to have laid it was still looking much distended near the vent.

27-6-30.—Five more eggs observed and a sixth later in the morning. This last was small with pointed ends. The contents of all appeared dark. On opening one the dark colouring was seen to be due to greyish streaks in the albumen. A little blood was present in the germinal disc.

28-6-30.—Two more rather small eggs.

30-6-30.—One small, malformed egg.

1-7-30.— do.

Unfortunately the snakes, although apparently in good health, refused to feed. On 16th July a female died and was found to contain six eggs. The largest individual was killed and preserved and the remainder released.

It was impossible to be certain which were the parents of the eggs laid in the tank, but two of the snakes were apparently males, and the eggs may probably be attributed to the females as follows:—

5-6-30.—6 eggs laid by Specimen A.

16-6-30.—1 egg „ „ B.

27-6-30.—6 eggs „ „ C.

28-6-30.—2 „ „ „ B.

30-6-30.—1 egg „ „ B.

1-7-30.—1 „ „ „ B.

16-7-30.—6 eggs (in oviduct) Specimen D.

This would give the average batch as 6, which agrees well with related Elapine land-snakes, with sea-snakes of known viviparous habit, and with Wall's discovery (3) of seven eggs in a female of *Laticauda laticaudata* (Linn.) in the Indian Museum. As Wall omitted to note whether these eggs contained embryos or not it is impossible to say whether this species is viviparous, but it probably resembles *L. colubrina* in its method of reproduction.

Two alternative explanations of the deposition of eggs by these snakes presented themselves. Either the snakes were truly oviparous, or the eggs were prematurely deposited. In order to determine the correct interpretation the eggs were examined for signs of development, and observations made on the snakes themselves both in captivity and in their natural habitat.

No eggs were found showing any sign of a developing embryo such as would be found in eggs taken from an ovo-viviparous snake. Efforts to hatch the eggs under varying conditions were unsuccessful.

Several of the snakes cast their skins whilst in captivity. This was effected by shedding the skin in one piece after the manner of land-snakes, and not in small shreds, lizard-like, as do those Hydrophine snakes which have been observed.

Mr. P. M. de Fontaine of the Raffles Museum was of great assistance to me in making enquiries of the light-keepers on the islands where these snakes are commonly found, and was able to put me in touch with Mr. Adolf Monteiro, who not only secured the specimens, but obtained much valuable information. He has observed the eggs laid in crevices in the rocks on the island on which the Raffles Light-house stands. The female remains coiled round the eggs until long after hatching, gradually taking on the dull coloration and opacity of eye which heralds the approach of the moult. According to another keeper, Mr. Haffenden, the female guards her eggs jealously, refusing to be driven away, and snapping at intruders, an attitude rare in these snakes at normal times. He has seen the moult take place just previous to the hatching of the eggs.

I visited the island on 16th—17th July, 1930. Like the neighbouring islands, Pulau Biola and P. Senang (Barn Id.), on which the snakes do not appear to live, it is a granite mass, but in order to build the light-house the surface has been levelled with blocks of coral. It is in the crevices of this loose material that the snakes live and apparently breed. A snake was seen in a crevice in an old fig-tree, and one taken from a drain in a concrete wall. Cast skins were found near some of the holes, but further exploration

would have necessitated an unwarranted amount of damage as the passages were long and winding. No eggs were obtained, but the keeper then in charge said that he had kept the snakes in captivity out of water, and one had laid eggs. Further reports seem to confirm the statement of Mr. Galistan, who has spent the greater part of his life at the various light-houses, that the snakes only appear in numbers from June to August. It seems to be established that they come to land, or at all events to these selected sites, for breeding purposes, June being the month of greatest activity. They may be seen in large numbers going down to the sea in the evening and returning in the early hours of the morning, though the female, after laying, probably fasts and does not leave her eggs.

Semper (4) found a female amongst the rocks of an island, coiled round about twenty young. He appears to have regarded the snake as viviparous but he says that the female comes ashore for breeding, and his estimate, as he apparently did not count the offspring, is probably quite erroneous. Half-a-dozen writhing snakes can easily give the impression of a score.

The facts adduced above appear to me conclusive, and afford additional evidence that the *Laticaudinae* are the most primitive of the Sea-Snakes, and the fore-runners of the *Hydrophiinae*. The form of the skull, which has been discussed in detail by Smith (2), the imbricate costals and broad, keeled ventrals, the form of the oral margin of the rostral shield, mode of casting the skin, and oviparity, all point to a close relationship with a terrestrial ancestor, probably of Elapine origin. The flat tail, whilst enabling these snakes to include the water within the range of their habitat, is not a draw-back on land and only postulates a marine ancestor if we accept the theory of adaptation to environment. On the other hand, the *Hydrophiinae* do not lack evidence of derivation from a land form. They are ovo-viviparous, and the eggs they form are clearly derived from those of a terrestrial ancestor. To regard them as primitive would require an egg-laying marine ancestor.

I cannot agree with Smith that there is any evidence to support his statement (2, p. vi) that the *Laticaudinae* were of Australian origin and the *Hydrophiinae*, Indo-Malayan. The division, whether early or late, took place in the original home of the ancestral form; there is no evidence to show where this was, but Indo-Malayan waters are undoubtedly very suitable for the launching of new forms. However, the fact that they are in some measure seasonal in their breeding may point to an origin outside these waters, for the most characteristic effect of the local climate is the complete lack of periodicity in growth and reproduction of both fauna and

flora. From their place of origin the two sub-families spread side by side; the fact that the *Laticaudinae* have flourished in Australian waters means no more than that they have found a suitable habitat, as did the rabbit.

The following points observed during the preparation of these notes may be mentioned here. In a previous paper (5) it was shown that specimens of *L. colubrina* lacking the azygous prefrontal, (one of the characters on which it is divided from *L. laticaudata*) are by no means rare. Three of the six specimens referred to above showed this condition, which is probably as common as the other.

Several ticks were found on one of the snakes. The females were of the same grey as the body-colour of the snake, the males brown, and the ticks were shed with the cast skin. They have been sent to a specialist for identification.

[Since I wrote the above Dr. Malcolm Smith has expressed his opinion, in a letter published in *Nature*, 11th Oct., 1930, that the eggs laid by the snake mentioned in my preliminary note (1) were prematurely produced in consequence of captivity. He cites a specimen of this species, examined by himself, and containing embryos enclosed in a thin semi-transparent covering; he has also seen a specimen of another snake of the sub-family *Laticaudinae*, *Aipysurus eydouxii*, in which the embryos were present but enclosed in a thicker covering. In my reply (*Nature*, 3rd Jan., 1931, p. 13) I have pointed out the incontrovertible nature of the evidence cited above, and drawn the conclusion that Dr. Smith's specimen points to the fact that both oviparity and ovo-viviparity may exist within the bounds of a single species. Either the individual must be capable of either mode of reproduction, according to the relative accessibility of land, or a local race exists in the islands near Singapore in which oviparity is the rule. Semper's discovery of a female guarding her young on shore must surely be regarded as further evidence of oviparity; it is extremely improbable that a snake which has developed such a definite adaptation to a truly aquatic existence as ovo-viviparity should sacrifice the advantage thus gained by coming ashore to deposit the living young!]

The co-existence within a genus of these two methods is by no means a rarity, and a species of lizard, *Lacerta vivipara*, is known in which the embryo may break its way out of the egg either before or after oviposition. Ovo-viviparity, far removed from viviparity with its placental connection between parent and young, is really a phase of oviparity; it is merely a question of the point in development at which the egg, already a separate entity, is deposited.]

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Notes on the Giant Frog, *Rana macrodon*

By N. SMEDLEY, M. A.

Two varieties of the frog, *Rana macrodon*, have been generally recognised. The typical form was first obtained in Java and named by Kuhl; a description was given by Dumeril and Bibron (1) in 1841. Günther's description (2) applies to this form.

In 1855 Blyth (3) described a new species from Tenasserim, *Rana fusca* (preoccupied) which Boulenger (15) has included under his var. *blythii*. As this is, in effect, a new name for *R. fusca* the type-locality may be taken as Tenasserim. Blyth's very inadequate description has been amplified by Anderson (4) and Stoliczka (5).

Dealing with specimens from Singapore, Blanford (6) says they are broader in the head than *R. fusca* and mentions broad-headed specimens from Java, in the British Museum. *R. fusca* of Blyth is placed by Boulenger (7 and 8) in the synonymy of *R. macrodon*.

Flower (9) distinguishes between the broad-headed Singapore and narrow-headed Penang varieties. He appears to regard the narrow-headed form as a northern variety and (10) comments on the fact that it is found as far south as Johore. Reference is also made to a 9 inch specimen taken by Butler in Kuala Lumpur, but neither Flower nor Butler (11) state to which form this specimen belongs; the latter speaks of "9 inch monsters from jungle-pools in the low country." Another large specimen, 9½ inches in length, was taken by A. D. Machado at Selinsing, near Bentong, Pahang in 1899 as recorded by Hanitsch (12). It is of the broad-headed variety and is evidently the specimen erroneously referred to Singapore by Boulenger (15). This author, in his work on the Peninsular fauna (14), evinces a determination to make the facts fit his preconceived theory of a northern and southern form

by his reference to "the larger variety found in Singapore," and a disregard of equally large specimens found farther north. In this he has been followed by Smith, who states (19) that "All specimens of *R. macrodon* from the northern part of the Peninsula differ from those found in the south in having a narrower head, larger eye, and longer hind-limbs." He had previously, in referring specimens from Pahang to var. *blythii*, noted that the tibio-tarsal articulation in the adults did not reach the tip of the snout.

I have examined a long series of specimens in the collection of the Raffles Museum, and the following conclusions are based on measurements of these specimens omitting immature frogs, and those in unsatisfactory condition or of dubious provenance.

The species probably gave rise at an early stage to two forms.

(A). The typical form, which is very stable, is of heavy build, head broad and flat, snout rounded, loreal region deep and very oblique.

So far as is known this form alone occurs in Java, but has spread throughout the lowlands of the western part of the Archipelago for it has been noted from Borneo, the Malay Peninsula and at least one of the islands off the west of Sumatra. It may therefore be expected from Sumatra unless it has become extinct there. So far as Malaya is concerned it is not confined to Singapore, but has been found in Johore and Pahang in localities not far from those occupied by the other form, in Malacca and in Selangor. It is this form which grows to the large size of over nine inches.

(B). The second variety has a narrower head, pointed snout, more vertical and shallower loreal region. It is very mutable, which probably accounts for its success; it is by far the commoner. With the exception of Java, where it appears to be absent, it exists side by side with the typical form wherever the latter is found, and is also recorded from Sumatra and the Philippines, but it is not confined to the lowlands. It tends to split up into recognisable local forms where segregated. Both forms occurs throughout the western part of the Archipelago, but probably eastern records are erroneous (17).

The tables show total length; length and breadth of head; the relation $\frac{\text{Total length}}{\text{Head breadth}}$ —, as this gives a good basis of separation of the two main forms (young specimens of the typical form however have a narrower head); relation of tibio-tarsal articulation to tip of snout (0 = reaches. + = surpasses, - = short of, tip).

NOTES ON THE GIANT FROG (*RANA MACRODON*)

Locality	Total Length	HEAD		Total Length Head Breadth	Tibio-tarsal articulation
		Length	Breadth		
1. Silensing, Pahang ..	119	44	57	2.08	—
2. do. ...	220*	81	95	2.32	—
3. Lubok Tamang, Pahang ...	79	28	28	2.82	+
4. do. ...	95	37	36	2.64	+
5. Malacca ...	92	35	40	2.30	—
6. Penang ...	100	44	43	2.54	—
7. do. ...	93	42	43	2.16	—
8. do. ...	84	37	37	2.27	—
9. Maxwell's Hill, Perak ...	100	40	43	2.33	100
10. do. ...	78	27	27	2.80	00
11. do. ...	76	28	27	2.82	00
12. do. ...	89	30	31.5	2.83	10
13. do. ...	77	26	26	2.96	10
14. do. ...	91	32	34	2.68	—
15. do. ...	86	29	29	2.96	—
16. do. ...	87	29	31	2.81	—
17. do. ...	89	34	34	2.62	—
18. do. ...	84	31	31	2.71	+
19. Gunong Kledang, Perak ...	78	27.5	27.5	2.84	—
20. Pelcpah Valley, Johore ...	90	31	31	2.9	+
21. do. ...	103	38	37	2.78	—
22. do. ...	102	35	35	2.91	—
23. do. ...	134	48	50	2.68	—
24. do. ...	145	56	56	2.59	—
25. do. ...	121	44	45	2.69	—
26. do. ...	98	37	38	2.58	—
27. Kota Tinggi, Johore	101	35	43	2.35	—
28. do. ...	69	25	25	2.76	+
29. do. ...	104	38	43	2.42	+
30. do. ...	64	24	25	2.56	+
31. ? Singapore, or Johore	210	86	100	2.1	—
32. Singapore ...	148	61	73	2.03	—
33. Bukit Timah, Singapore ...	68	25	28	2.43	—
34. do. ...	80	29	29	2.77	—
35. Sedagong, Tioman Id.	125	47	47	2.66	—
36. do. ...	89	32	32	2.78	0
37. Siberut Id. ...	90	34	38	2.34	—
38. do. ...	105	33	35	3.00	—
39. do. ...	81	30	30	2.70	—
40. do. ...	90	32	34	2.65	—
41. do. ...	91	31	31	2.87	—
42. do. ...	98	36	39	2.51	—
43. do. ...	84	32	32	2.63	—
44. do. ...	92	34	37	2.49	—
45. Baram, Borneo ...	80	28	30	2.67	—
46. Bettotan, B. N. Borneo ...	90	32	33	2.73	00
47. do. ...	90	30	32	2.81	00
48. Kina Balu ...	68	24	24	2.83	00

*235 when fresh

The following are analyses of specimens from various localities:—

Perak (*Maxwell's Hill and Gunong Kledang*). Belongs to (B) but snout broadens slightly with age. Hind limb usually shorter than, but in some cases equals and in one specimen surpasses snout.

Pahang. (Silensing) (A).

Pahang. (*Lubok Tamang*) (B). Narrow head, long legs.

Penang. (B), with rather large head.

Malacca. (A).

Johore. (Kota Tinggi) (A).

Johore. (*Pelepah Valley*) (B). Narrow head, legs long where measured.

Singapore. (A and B).

Sibicratus, Mentawai Ids. Head as broad as long or slightly broader, but narrow compared with length of body; legs short.

Borneo. { *Kina Balu*
 Baram
 Bettotan } Head as broad as long or broader;
 legs medium.

The variety *leporina* of Andersson (18), type locality Tumbang Maroewei, Central Borneo, is not represented in the collection of the Raffles Museum, but appears from the description to be of the same order as the above minor forms.

A list of the most important references is appended.

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Notes on Elasmobranch Eggs

By N. SMEDLEY, M. A.

(with three text figures)

I. *Unidentified material*

Work on the spirit collections in the Raffles Museum has brought to light material collected by Capt. A. N. Fraser in July, 1913, from a telegraph cable lying at a depth of 300 fathoms, lat. $10^{\circ} 27' 46''$ S. and long. $126^{\circ} 4' 30''$ E. in the Timor Sea, N. W. of Australia.

It makes an interesting addition to the series of egg-cases examined by me in 1926—7 (Journ. Malayan Br. R. A. S. IV, 1926, pp. 164—166, and V, 1927, pp. 355—359).

In the present instance it is unfortunately impossible to determine even the genus, but if the form of the case (Fig. 1) is any

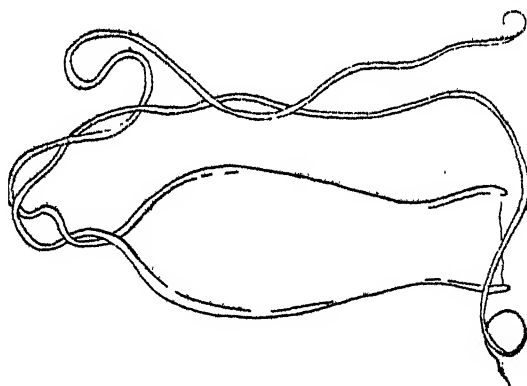


Fig. 1. Unidentified egg-capsule.

indication of its affinities, it may be placed between the genera *Scyllium*, with four tendrils, and *Chiloscyllium*, where tendrils are completely absent and anchorage is effected by means of a band of threads.

The egg-cases, of which six were taken attached to a hydroid which was presumably growing on the cable, are about 2 inches in length by a little over $\frac{3}{4}$ inch in greatest depth. In form they resemble a small *Scyllium* case, but the tendrils, about 5 inches in length, occur only at the posterior end of the case which, as in *Scyllium*, is contracted so that the corners approach one another giving a pointed appearance. The anterior end is truncate, with corners widely separated, and has no trace of tendrils in any of the cases examined.

The embryo, in the only specimen bearing one, is about $1\frac{1}{4}$ inches in length, in an early stage of development, and in very poor condition. It had been squeezed out of the anterior end of the case, but was connected by a duct to a yolk-sac, $\frac{3}{8}$ inch in diameter, within the case. The specimen had unfortunately been preserved in strong spirit, and I could therefore make no identification.

II. *Orientation and Rotation of the Embryo in Scylliidae.*

In writing my previous notes on the egg-cases of *Scylliidae* I made certain observations on the position of the embryo in relation to the capsule. I have recently had an opportunity of seeing R. S. Clark's comprehensive papers on Rays and Skates¹ which were not previously available to me. His observations were carried out on living specimens in an aquarium; owing to the lack of facilities such methods cannot be employed locally, nor is material so readily accessible.

The embryos examined by Clark were "observed to undergo complete turning movements on the horizontal plane". Re-examination of the series of embryos of *Chiloscyllium indicum* points to the occurrence of a similar phenomenon in this species.

The material dealt with consisted of a series of five separate egg-cases which I numbered 1—5 in order of development, and a second series of three cases attached to one another by the filamentous band which is a striking feature of the egg-cases of the species.

Of this latter group one case was empty, the embryo having apparently hatched out, as the anterior end of the case was open; the other two contained embryos.

Incorporating this group with the other five, and reading the whole as a single series, but retaining the original numbering for the sake of comparison these three cases now become Nos. 4a, 6 and 7.

The full list now reads:—

1. Embryo minute, adhering to wall of case.
2. Embryo, 50 mm. in length, lying along upper margin of case; head pointing to *anterior* end.

¹ Journ. Marine Biol. Assoc. XII, 1922, pp. 577—643 and XIV, 1927, pp. 661—683.

² As before I have used the term *anterior* to apply to the wider end of the case, through which the embryo escapes; the pointed end is the *posterior*. The upper margin is that from which the band of threads arises. The very young embryo is therefore in the *normal* position, head pointing anteriorly; dorsal surface uppermost. In the later stages the embryo turns, apparently always on to the same side.

NOTES ON ELASMOBRANCH EGGS

3 and 4. Embryo, 90 mm. in length, with form and markings similar to adult, lying coiled in case; head pointing to *anterior* end of case. (Fig. 2).

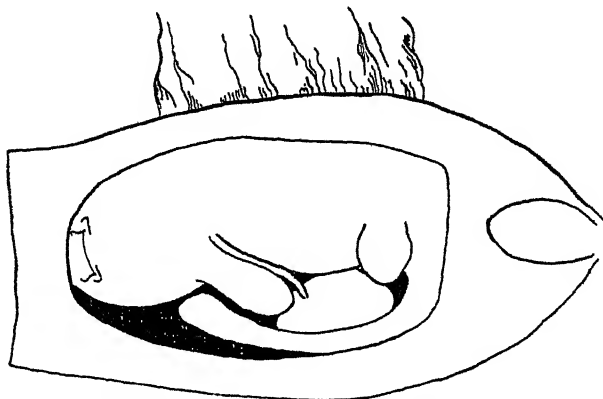


Fig. 2. *Chilosyllium indicum*. Egg-case with wall cut away to show embryo. Stage 4.

(In these and subsequent stages the embryo has turned laterally through a right-angle, and is lying with its ventral surface apposed to the left wall of the egg-case).

4a. Young male at rather more advanced stage than the preceding, head pointing to *anterior* end.

5. Embryo of 95 mm. lying with head pointed towards *posterior* end of case. (Fig. 3).

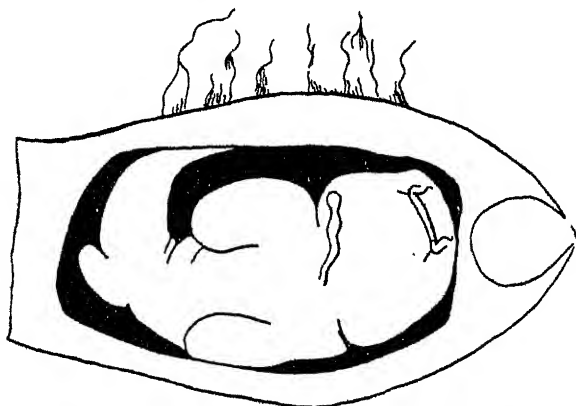


Fig. 3. *Chiloscyllium indicum*. Egg-case with wall cut away to show embryo. Stage 5.

6. Female almost ready for hatching; head anterior.

The embryo therefore appears to make a complete turn during the later stages of development before hatching.

The specimens of other species available were too few for a comparison with regard to rotation, but the following points emerge.

The newly-deposited capsule of the ray has no provision for anchorage by tendrils. After extrusion it must therefore rely on accidental entanglement of the fibrous attachment processes. It falls on to one side which then becomes the ventral surface and the embryo develops accordingly. In those cases where hooks are developed at the closed (posterior) end there is a tendency for the more convex wall to become the dorsal surface. The embryo begins life in the same plane in which it lies on escape, which is accomplished, as a rule, through the anterior end of the capsule. During that period of development which precedes curling, the embryo usually lies with the head pointing to the closed end of the capsule.

The species of *Scylliidae* examined were *Chiloscyllium indicum*, *Scyllium marmoratum*, *Stegostoma tigrinum* and an unidentified species. The typical Scylliid possesses tendrils which become attached to some fixed object before extrusion of the capsule, and will therefore not tend to fall on one side. *Chiloscyllium* has retained the typical mode of development, but here the attachment band, though less efficient than the tendrils of *Scyllium*, is a much more specialized anchor than the shorter felt-like mass seen in the Rays. The walls of the Scylliid capsule are equally convex. The embryo begins life in what may be termed the normal plane of the capsule. As it increases in length beyond the limits of the capsule it turns on its side for convenience in curling. It is then in the same plane as the Ray and rotates as curling takes place.

Stegostoma, although without anchorage, has not forsaken the typical Scylliid method of development, at least in the early stages. It is not yet known whether it changes position before hatching, but it is quite possible that it does not, as development appears to take place very rapidly, the external adult features being present whilst the embryo is still lying along the upper margin of the capsule, and food-yolk still lying loose in the case.

An Osteoglossid Fish in the Malay Peninsula

By N. SMEDLEY, M. A.

The Family *Osteoglossidae*, ranking amongst the oldest of the Teleostean groups, is represented in Asia by the genus *Scleropages*. *S. leichardti* Günth., occurs in Queensland and is recorded doubtfully from New Guinea; *S. formosus* (Mull. and Schl.) was for long known only from Sumatra, Banka and Borneo, but an example was taken in the Malay Peninsula in 1922, and a second in 1925.

The following extract is taken from the Annual Report of the F. M. S. Museums for 1922 by Mr. H. C. Robinson (F. M. S. *Government Gazette* of 1923):—

“An interesting addition to the fauna of the Malay Peninsula was obtained by Messrs. Evans and Henderson in the Krian Irrigation Reservoir at Bukit Merah. It is a fish of the very primitive family *Osteoglossidae*, which is known from the tropics of both Hemispheres and from Australia, and from Borneo and Sumatra. The family includes amongst its members the largest existing fresh water fish. Our species is closely allied to, if not identical with, the Sumatran *Scleropages formosus* but is not so brightly coloured. Besides its Krian habitat it is also known to the Malays of the Tembeling under the name *baju rantai*,¹ possibly in allusion to its extremely hard and dense scales”.

I have considered it advisable to repeat it here as the report in question is liable to escape notice. The reference to a difference in colour may be disregarded, and I have no doubt of the identification.

The second specimen was also taken from the Bukit Merah Reservoir, by the Fisheries Dept., in 1925, and was mounted and presented to the Raffles Museum. As I had access to both specimens, which owing to their mounted condition could not be sent to Dr. L. F. de Beaufort who is working on the study collection of the Museum, I put on record particulars of the specimens.

Collected by	Lateral line ²	Length without caudal	Total length
A. Evans and Henderson	23	500 mm.	580 mm.
B. Fisheries Dept. ...	23	440 „	500 „

¹. Chain-coat or coat-of-mail.

². From upper corner of opercle, not including the large scale above the opercle.

It is noteworthy that both specimens are longer than the maximum given by Weber and de Beaufort¹, which is 430 mm., and these do not appear to be fully-grown fishes. I have omitted fin-counts as the mounting process made it impossible to take them with accuracy.

The fish is known to the Perak Malays as *kělěsa*.²

A Fresh-water Crab, *Paratelphusa sexpunctatum* (Lanch.) in the Malay Peninsula

By N. SMEDLEY, M. A.

(Plate III and two text figures)

Several specimens of a crab, found to be doing considerable damage to young padi-plants in Kedah and Perlis, were recently (Sept. 1930) collected in North Kedah by Mr. W. N. Sands, Principal Agricultural Officer, Kedah, and sent to the Raffles Museum. I have identified them as *Paratelphusa* (*Paratelphusa*) *sexpunctatum* (Lanch.). This species was described and figured by Lanchester (1) from two females, one from Sai Kau, Nawngchik and the other from Cape Patani, under the name *Potamon* (*Paratelphusa*) *sexpunctatum*. As the male was not available and the present series includes 3 ♂♂ I append a description of the salient features.

Carapace. Like that of the female but rather more narrowed behind. The centre punctum of each group of three in both sexes is not so clearly defined as in Lanchester's figure. The measurements of the carapace in all specimens are as follows:—

♂♂		♀♀	
Length	Breadth	Length	Breadth
mm.	mm.	mm.	mm.
A. 38	49	D. 39	49
B. 34	43	E. 36	45
C. 33	42	F. 31.5	39.5
		G. 29	37

¹. Fishes of the Indo-Australian Archipelago II, 1913, p. 13 (text-figure).

². Since writing the above I have examined a fresh specimen obtained in Oct. 1930 by the Fisheries Dept. from the Bukit Merah Reservoir, Perak. The fin-counts agree in all respects with the description; the lateral line has 25 scales, and as it is continued on to small scales at the base of the caudal this may be true for the other specimens examined (these were mounted and painted). Total Length 575 mm.



Paratelphusa (Paratelphusa) sexpunctatum (Lanch.).
♂ Slightly enlarged.

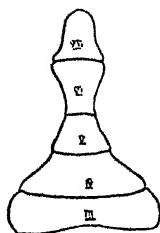


Fig. 1. *Paratelpusa* (*Paratelpusa sexpunctatum* (Lanch.) abdomen of adult male. Nat. size.

Abdomen. (Fig. 1). The third segment extends proximally between the bases of the legs, becoming very slightly narrower distally, edges convex; the fourth segment narrows rapidly by about half its proximal width, edges slightly convex proximally, concave distally; the narrowing continues more gradually through the fifth segment and slightly on to the sixth which, after a slight decrease, expands considerably; the seventh segment narrows gradually to a rounded tip.

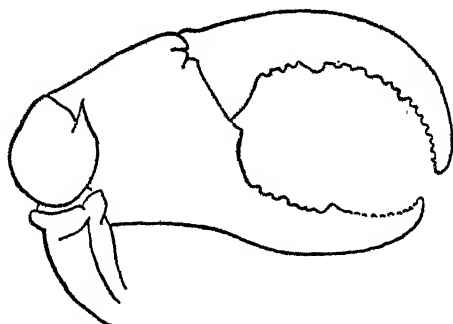


Fig. 2. *P. (P.) sexpunctatum*. Left chela of adult male. Nat. size.

Cheliped. (Fig. 2). Very much enlarged in the male; fingers not much longer than the palm; dactylus strongly curved, with a greatly enlarged tooth rather nearer the proximal end, another not so large half-way between this and the tip, interspaces with small teeth; small teeth with one greatly enlarged about the middle of the fixed finger. Length of the hand in the males: A. 57 mm.; B. 44 mm.; C. 43 mm.

In all specimens, both male and female, the left cheliped is enlarged; in Lanchester's figure (1) the right cheliped is bigger. There is a sharp subterminal spine on the upper surface of the merus of either cheliped in both sexes, characterizing the sub-genus as defined by Alcock (2).

This species is related to *P. sinensis* M.-Edw., which ranges from Burma to China, and was recorded by Lanchester (3) from Singora, Tale Sap, where it was taken by the Skeat expedition. Like that species, it has a subterminal spine on the meri of all the walking-legs.

The crabs of the genus *Paratelphusa* have been found damaging young rice plants, and in some cases the bunds, in the Netherlands East Indies (4), Burma (5), India (6) and Ceylon (7) in addition to Malaya. Dammerman (4) gives as their enemies the otter (*Lutra* sp.), king-fishers, some birds of prey, and water fowls. A control measure suitable for use in padi fields "consists in pouring a small quantity of carbon bisulphide in the holes and closing them", a method also recommended by Wagle (5). Ghosh (6) and Lord (7) have successfully tried trapping the crabs in earthenware pots with mouths about half the maximum diameter of the pots. The pots are sunk until their rims are about 2 in. or 3 in. below the water-level, and are placed in position a few days after sowing or transplanting. Rice bran is recommended as the most satisfactory bait, and is placed in the pots in the evening. Lord also mentions that the crabs are most easily caught after heavy rain which tempts them out of their holes. Mr. Sands reports *P. scarpunctatum* as "becoming active and breeding rapidly with the advent of wet conditions". The young do not pass through an active zoea stage but leave the abdomen of the mother when fully developed. This probably accounts for their sudden appearance when rain has produced suitable pools.

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A method since applied in Malaya by Mr. Sands (8).

Notes on King-Crabs (Xiphosura)

By N. SMEDLEY, M. A.

Since the publication of my previous note (1), I have seen two papers bearing on this subject and published at about the same time, by Dr. Ch. Gravier of the Museum National d' Histoire Naturelle in Paris (2 and 3). I cannot agree with several of his conclusions. The following notes are based on the material previously recorded by me (1), on a further adult specimen of *Carcinoscorpius rotundicauda*; and on two adult males, a large female and an immature specimen, probably male, of *Tachypleus tridentatus*, from Hong Kong presented to the Raffles Museum by Dr. G. A. C. Herklots, of the Department of Biology, University of Hong Kong.

In this account of the caudal appendage (2), Dr. Gravier has given a key for the identification of the known species by examination of this organ alone. It runs as follows:—

A l'appendice caudal	{	une gouttière ventrale	{	bien marquée; des épines sur toute la longueur de l'arête dorsale et sur le tiers antérieur des arêtes latérales..... <i>Tachypleus tridentatus</i> (Leach.) légèrement marquée et sur la moitié postérieure seulement; des épines de dimensions décroissantes d'avant en arrière sur la moitié antérieure de l'arête dorsale; pas d'épines sur les arêtes latérales <i>T. gigas</i> (Müller); quelques épines sur l'arête dorsale; quelques dentelures sur les arêtes latérales <i>Xiphosura polyphemus</i> (Linné).
		pas de gouttière ventrale	{	Ni épines, ni dentelures sur les arêtes qui sont toutes mousses <i>Carcinoscorpius rotundicauda</i> (Latr.)."

With regard to the ventral groove, Dr. Gravier may have confused the two species of *Tachypleus*. All my specimens of *Tachypleus gigas* have a well-marked groove extending practically the whole length of the appendage, and not only in the posterior half, in both sexes. In *T. tridentatus* the groove is not so well-marked and may be lacking either posteriorly or anteriorly or both.

The spines on the dorsal crest are somewhat irregular in length in both species; there is a tendency towards decrease in length posteriorly, though longer spines project at intervals. These spines extend the whole length of the appendage.

Spines are present on the anterior portion of the lateral borders of the caudal appendage of *T. tridentatus* in one male and one female of the Hong Kong material; they are totally lacking in the other male, the immature specimen, and in the previously recorded female from Sarawak. This is an aberration of the same order as the

presence or absence of the spine on the lateral crest bordering the gill-chamber on the ventral surface of the opisthosoma in *Tachypleus gigas* and *Carcinoscorpius rotundicauda*, and like it is not related to size or age. There may be some relation between the presence or absence of spines and the type of bottom on which the individual is living. The smooth-edged caudal appendage of the male referred to above is rather longer than the carapace; in the specimen with spines on the lateral crests, the appendage is considerably shorter. In the larger of the Hong Kong females the end of the caudal appendage is buckled as though it had been called upon to perform its function as a lever too soon after the moult, whilst the chitin was not fully hardened.

The difference in form of the anterior margin of the carapace in the male and female of *T. tridentatus* is very marked. The portion between the two excisions is deeply excavate, as may be expected from the method of copulation, in which the ventral surface of the male and the dorsal surface of the female are apposed. The anterior margin outside the excisions is reflected upwards and backwards. Also related to the copulatory process is the compression of the median spine on the anterior ventral surface of the prosoma, which in the female projects ventrally in a very pronounced manner.

A similar but less marked indentation and reflexion is present in the males of *Tachypleus gigas* and *Carcinoscorpius rotundicauda*, but there are no lateral excisions; the median spine is somewhat compressed and less developed in the males. The degree of adaptation in the male King-Crab would therefore appear to bear some relation to size. Of the smaller species we have *Carcinoscorpius rotundicauda* with two pairs of chelate but modified claspers, and *Limulus polyphemus* with one pair of hemichelate claspers. *Tachypleus gigas* has two pairs of hemichelate claspers, and the same condition is also found in *T. tridentatus* with the addition of the two excisions in the anterior border of the carapace which allow of a firmer hold; a like advantage accrues from the more deeply excavate median portion.

The genital operculum of *T. tridentatus*, whilst varying considerably in the extent to which the internal branches are separated at the tip, conforms in all my specimens to Pocock's characterization of the genus (4, p. 262).

Attention must be drawn to the following possible errors in identification of Dr. Gravier's specimens:—

1. The specimen collected by Marche in Philippine waters and placed by Dr. Gravier under *T. gigas* (3, p. 319 and 2, p. 94) appears both from its size, totalling 72 cm., and from the northerly locality, to be an example of *T. tridentatus*. In large females of this species the spines on the posterior border of the opisthosoma, from which the specific name is derived, may be somewhat indistinct.

2. Examples placed under *T. tridentatus*, numbered *V* and *VI*, from Batavia, appear to have exhibited no characters to justify their inclusion here, and are possibly *T. gigas*. This view is borne out by the photograph of one, a male (3, p. 327). Similarly specimens *VIII* (b), (c) and (d) are almost certainly *T. gigas*. The respective localities, Siam, Mer des Indes, and Batavia are all outside the known range of *T. tridentatus*.

I have mentioned the above instances in order to dispel any misconception they may raise as to the ranges of the species.

A few noteworthy points occur with regard to the fresh material of *Tachypleus tridentatus* from Hong Kong.

In the female the fourth moveable spine on the left of the opisthosoma, instead of being short and truncate as usual in this sex, is long like that of a male; the tip is broken. The corresponding spine on the right is bifid and gives rather the impression that spines of both male and female type were developing and had fused as they became impacted.

The sixth prosomatic appendage on the right side of the same specimen has probably been lost and regrown as it is much smaller than its fellow; there are only three sclerites at the apex of the penultimate segment instead of four, and the sixth segment only slightly protrudes beyond these. There is a small moveable spur in addition to the larger one usually found at the apex of the fourth segment.

Shipley (5, p. 260) comments on the "self-respecting, well-groomed appearance" of King-Crabs, and this condition is one which may be expected in a burrowing animal, without necessarily postulating a secretion, as does Shipley. Most of the examples which I have seen bear this out, but the two large males from Hong Kong are exceptional. The ventral surface and appendages, in both specimens, are liberally supplied with *Polysoa* and some barnacles both of the stalked and sessile types, and whilst the dorsum of one specimen is moderately clear, that of the other is thickly encrusted. A full-grown male of *T. gigas* is in a similar state. It seems possible that these are old males, less actively burrowing than younger individuals.

In both sexes the carapace, and particularly the opisthosoma, is liberally sprinkled with small spines. An anonymous note which recently appeared in the China Journal of Arts and Sciences (7) is accompanied by a photograph of the male and female of *T. tridentatus* (under the name *Xiphosura longispina*). Curiously enough the correspondent has chosen for his exposition a female which is abnormal in having all the moveable spines of the opisthosoma long, as in the male.

Dr. Gravier refers (3, p. 314, footnote) to several cases, both in *Tachypleus tridentatus* and in *T. gigas*, in which occur what he calls "anomalies de developpement". As these are cases where

one of the posterior points of the carapace is affected, they are probably exactly similar to those which I have noticed in my previous paper (1, p. 77). I cannot agree with Dr. Gravier when he says "la cause de ces anomalies de croissance existait, sans doute, en puissance dans l'oeuf". They appear to me to be much more satisfactorily explained as the result of attacks by enemies. The wounded edge closes and heals; the new spine is developed at that point where the edge of the wound meets that branch of the nerve which supplied the old spine, and is therefore developed rather toward the inner than the outer margin of the prosoma (cf. 1, fig. 4, and 5, fig. 156). I had hoped to confirm this by dissection, but have been unable to obtain a specimen thus damaged suitable for the purpose. The healed surfaces do not appear to me to differ in any way from those of other undoubted wounds. Abnormalities such as the double caudal appendage recorded by Dr. Gravier (6)¹, or the appearance of the secondary sexual characters of one sex in specimens of the other, instances of which have been quoted both by Dr. Gravier and by myself, may much more safely be asserted to have their origin in the egg.

With regard to *Carcinoscorpius rotundicauda*, this species is always readily distinguished by the smooth, round caudal appendage. It is true, as Dr. Gravier remarks (3, p. 318) that the prosomatic appendages are chelate in both sexes, but the adult male is easily detected by the greatly swollen propodites of the claspers. A male from Pulau Bulang, Rhio Archipelago has claspers which are markedly different from those of the female, more accentuated than those of the specimen figured by me (1), and intermediate between that and the figure given by Pocock (4).

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Errata (Bull. Raffles Mus., 2, 1929, pp. 73—78).

I take this opportunity to correct the following errors in transcription in my previous paper:—

p. 75 line 16—for "Lyddeder" read "Lydekker".

p. 75 lines 28 and 32 for "opisthoma" read "opisthosoma".

p. 76 line 3— " " " "

p. 77 line 9— " " " "

p. 78 lines 25 and 28 " " " "

p. 77 line 15—for "exceeding" read "of".

¹ The locality of this specimen is erroneously stated; by "Kuchiry River" should doubtless be understood "Kuching River".

A "Flying" Snake

By H. M. PENDLEBURY

On Sunday, January 12th, 1930, I was walking along the Bentong road in Pahang, Federated Malay States, at about the fifth mile on the Bentong side of Ginting Sempak.

On the left of the road, the hill descends steeply to a valley, and about one to two chains down the hillside had been cleared though some undergrowth had started to grow up again. The lower part of the valley still holds a number of tall forest trees.

I happened to be looking towards the tops of these trees amongst which some monkeys were moving when my attention became concentrated on an object which floated from near the top of one of the tallest trees into the rank undergrowth down the hillside below me. For a moment I thought that the object was merely a wisp of dried grass, but then I saw that it was clearly a snake about two feet six inches in length on which the sun was shining. From what I saw of it, its colour was blackish above and greyish beneath; the head and neck were reddish-yellow. Its body was held in a double "S" position, flattened beneath, and during descent it lashed its tail vigorously to the right several times as though trying to steer itself to some particular spot. These tail lashings became more pronounced immediately before it landed when it dropped the tail end of its body and alighted, under complete control, on some large-leaved plant and disappeared into the undergrowth. The angle of descent was roughly 45 degrees, and the distance it travelled would be, I should say, about 100 feet in roughly seven seconds.

I can find no record of a similar observation in this country, but the late Mr. R. Shelford recorded (Proc. Zool. Soc. 1906, p. 227) three species of snakes: *Ahaetulla picta* Gmel. (= *Dendrophis pictus*), *Chrysopelea ornata* Shaw, and *Ch. peleas* And. (= *chrysochlora* Reinw.) which had been observed to "fly" in Borneo. But in every case the body of the snakes was held straight during the fall, the ventral surface being "hollowed so that it fell, not in a direct line to the ground, but at an angle, the body being kept rigid the whole time". In my observation the body of the snake was not kept rigid, and the lashing of the tail was one of the prominent features; the fall appeared to be under control throughout.

On "rattus" rats of the coasts and islands of Malacca Straits'

By F. N. CHASEN and C. BODEN KLOSS

SYSTEMATIC

Rattus rattus kunduris subsp. nov.

Rattus rattus payanus subsp. nov.

Rattus rattus jemuris subsp. nov.

*R. rattus jalorensis*² is the indigenous field rat of the greater part of the Malay Peninsula and most of the mainland of Sumatra but a darker form, *rhionis*³, described from Bintang Island in the Rhio Archipelago, extends to Palembang on the east side of Sumatra⁴. Dark rats occurring sporadically in south Johore⁵ must be regarded as *rattus* > *rhionis* as their skulls have not the large average size of true *rhionis*.

R. r. rhionis is a very distinct race. It is a sleek rat, darker and larger than *jalorensis*. The skull of the type measured 44 mm. in its greatest length and ten adults give a range of 43—45 mm. for the same measurement. A few *jalorensis* from the southern part of the Malay Peninsula have the total length of the skull about 42 or 43 mm. but most are rather smaller than this⁶. Occasionally the skull is between 44 and 45 mm. in total length but such large animals are exceptional.

The range of *rhionis* is not yet defined, but in the Rhio Archipelago it certainly extends from Bintang in the east to Bulan in the west and Galang in the south. Some specimens from Galang and Bulan are less brown and considerably more blackened above than animals from Bintang and Battam but those from the first two mentioned islands are fresher skins. The rats of the islands of Sugi, Durian, Karimon and Kundur, all lying to the west of Bulan have been listed as *neglectus* (i.e. *jalorensis*) by Dammerman⁷.

¹. Here considered as extending from Pulau Terutau in the north to Pulau Kundur in the south.

². *Mus jalorensis* Bonhote, Fasc. Malayenses, Zool., pt. 1, 1903, p. 28 (Jalor, Peninsular Siam).

³. *Mus rattus rhionis* Thomas and Wroughton, Ann. Mag. Nat. Hist. (8) iii, 1909, p. 441 (Bintang Island, Rhio Archipelago).

⁴. Kloss, Treubia, 2, 1921, p. 124.

⁵. They have been referred to *jarak* by Bonhote in P. Z. S., 1906, p. 10, and to *griseiventer* by Robinson and Kloss in Journ. Fed. Mal. States Mus., iv, 1909, p. 122.

⁶. For the measurements of a series of *jalorensis* from Sumatra see Rob. and Kloss, Journ. Fed. Mal. States Mus., viii, Part II, 1918, p. 63 under "*neglectus*".

⁷. Treubia, viii, 1926, p. 317.

We have large series before us from some of the most westerly of the islands. While it is true that they are quite distinct from *rhionis* they cannot be placed in *jalorensis* and may be differentiated as:—

***Rattus rattus kunduris* subsp. nov.**

Mus near *rattus*, Miller, Proc. U. S. Nat. Mus., xxxi, 1906, p. 266.

Mus "*rattus*", Lyon, Proc. U. S. Nat. Mus., xxxvi, 1909, p. 490; Thomas and Wrought., Journ. Fed. Mal. States Mus., iv, 1909, p. 122.

Like *jalorensis* of the Malay Peninsula and Sumatra but larger; the pelage harsher.

Type:—Adult male, skin and skull, collected on Kundur Island, Rhio Archipelago, on 21st Aug., 1908, by H. C. Robinson and E. Seimund, S. M. No. 1694/08.

External dimensions (taken in the flesh):—Head and body 179 mm., tail 195 mm., hind-foot 39 mm., ear 22 mm.

Skull:—Total length 46 mm., condylo-basilar length 40.6 mm., palatilar length 22 mm., diastema 13.1 mm., zygomatic breadth 22.1 mm., upper molar row (alveoli) 7.1 mm., palatal foramina 8 mm., length of nasals 17 mm.

Remarks:—This rat combines the pale colour of *jalorensis* with the large size of *rhionis*. The skulls of six adults from Karimon measure:—greatest length 44.9—46.5; palatilar length 21—22.5; zygomatic breadth 21—22.5; upper molar row (alveoli) 7—7.5 mm.

We can see no significant differences between specimens from Little Karimon Island (8 specimens); Karimon Island (44 specimens); Merah Island near Karimon Island (5 specimens); Kundur Island (7 specimens) and Tulang Island near Kundur (3 specimens). There is a possibility that this is also Dammerman's *neglectus* of Sugi and Durian Islands.

This form is rather like *R. r. batin* Robinson¹, from the outlying island of Mapor or Panjang in the east of the Rhio Archipelago but it is larger: *batin* is nearer to *jalorensis* but has the pelage hispid and a marked development of the long black piles on the lower back.

The first form to be described from an island in the Straits of Malacca was *jarak*² from Pulau Jarak about forty miles west of the mouth of the Perak river.

R. r. jarak is a good race although its describer wrongly suggested that it belonged to the *muelleri* group. It is darker than *jalorensis*: the upperparts are browner and less fulvous and the underparts are usually sullied with grey although sometimes white as in *jalorensis*.

¹ Journ. Fed. Mal. States Mus., vii, 1916, p. 66.

² *Mus jarak* Bonhote, Journ. Fed. Mal. States Mus., i, 1905, p. 69.

There is very little, if any, difference in size between the two forms. The largest of a long series of adult skulls of *jarak* measures 43 mm. in its greatest length: fifty-five adult males give a range of 38.9—42 mm. for the same measurement.¹

The type of *jarak* had the tail shorter than the head and body but this is not always the case and usually the tail is a little longer than the head and body as in *jalorensis*.

R. r. jarak is smaller and darker than *kunduris*; smaller and less blackened than *rhionis*.

*R. r. rumpia*² from Pulau Rumpia, Sembilan Islands, off the Perak coast is a dark rat like *jarak* but it is much larger and the skulls of adults range from 46 to 48 mm. in greatest length. The type does not represent the maximum development of the race. Other subspecific characters are given in the original description.

Six rats from Pulau Lalang in the Sembilan Islands also represent a dull, dark race but unfortunately only two of the specimens are adult. One of these is without a skull and the only skull is somewhat broken.

The adults have the hind-foot measuring 36 and 34.5 mm. The greatest length of the skull (worn teeth) is about 43.5 mm. The Lalang rat can therefore be regarded as either a very large *jarak* or a small *rumpia*, the latter preferably, on geographic grounds.

Rats also occur on other islands in the southern part of the Straits of Malacca. The form from Pulau Berhala, a small island about forty miles southwest of Pulau Jarak and twenty-four miles from the Sumatran Coast seems inseparable from *jalorensis* of the mainland.³ A series of fourteen skins from Pulau Jemur in the Aroa Islands is distinct and must be separated on colour.

***Rattus rattus jemuris* subsp. nov.**

Like *jalorensis* of the Malay Peninsula and Sumatra but the upperparts paler, distinctly more buffy and less brown.

Type.—Adult male, skin and skull, collected on Pulau Jemur, Aroa Islands, Straits of Malacca on 13th Nov., 1906. S. M. No. 1876/07.

External measurements (taken in the flesh).—Head and body 180 mm., tail 192 mm., hind-foot 37 mm., ear 21 mm.

Skull.—Total length 43 mm., condylo-basilar length 39 mm., palatilar length 22 mm., diastema 13.4 mm., zygomatic breadth 20.2 mm., upper molar row (alveoli) 6.9 mm., palatal foramina 8 mm., length of nasals 15 mm.

¹ An intensive study of the measurements of *jarak* is published by Robinson in Journ. Fed. Mal. States Mus., 1907, 1916, p. 7.

² *Mus rattus rumpia* Rob. and Kloss, Journ. Fed. Mal. States Mus., iv, 1911, p. 169.

³ *Rattus rattus neglectus* Chasen and Kloss, Misc. Zool. Sumatrana, xxvii, 1928, p. 1.

Rats from Pulau Pisang off the west coast of Johore are like *jalorensis* but run rather large: the pelage is also more hispid. Adults have the greatest length of the skull commonly 43 or 44 mm., but they do not attain the size of *kunduris* and can conveniently be regarded as *jalorensis* > *kunduris*.

No white-bellied field rat has yet been taken in Singapore or on any of the smaller neighbouring islands.

The first race to be described from the islands at the northern entrance to the Straits of Malacca was *pannosus*¹ from Pulau Adang in the Butang Islands. This is a large race and by reason of its very coarse, shaggy pelage needs no comparison with any form mentioned above.

An aged female before us has the total length of the skull 46.1 mm.; upper molar row (alveoli) 8.6 mm.

Miller afterwards separated *pannellus*² from Pulau Rawi in the Butang Islands from *pannosus* on the following characters, "skull less robust, incisive foramina distinctly narrowed anteriorly, and teeth usually not so large external appearance not appreciably differing". We have no material.

Rats from Pulau Langkawi and Terutau are smaller than the Butang Island forms and are very near to *jalorensis*. The largest skull (from Terutau) measures 43 mm. in its greatest length.

There is a tendency to large cheek teeth in the Langkawi race which has been named *viclana*³ by Miller, and examples from Terutau and the smaller island of Dayang Bunting south of Langkawi are best placed with *viclana*: The field rat of Penang is *jalorensis*.

The rat on the tiny island of Paya, south-east of Langkawi and about sixteen miles from the coast of Kedah is quite distinct from *jalorensis*: it is a large form much more like *rumpia* from the Sembilan Islands than *jalorensis*.

***Rattus rattus payanus* subsp. nov.**

Like *R. r. rumpia* but much darker.

Type.—Adult male, skin and skull, collected on Pulau Paya. Straits of Malacca, 24th April, 1915.

External dimensions (taken in the flesh).—Head and body 188 mm., tail 198 mm., hind-foot 37 mm., ear 19 mm.

Skull.—Total length 46.2 mm., condylo-basilar length 40 mm., palatilar length 21.7 mm., diastema 12.1 mm., zygomatic breadth 21 mm., upper molar row 7.3 mm., palatal foramina 7.2 mm., length of nasals 16.5 mm.

Remarks.—We only have three specimens of this new race but all are much darker on the upperparts than any of a large series of *rumpia* taken in several months throughout the year.

¹ *Mus pannosus* Miller, Proc. Biol. Soc. Wash., xiii, 1900, p. 190.

² *Epimys pannellus* Miller, Smiths. Misc. Coll., 61, No. 21, 1913, p. 8.

³ *Epimys rattus viclana* Miller, Smiths. Misc. Coll., 61, No. 21, p. 13.

Notes on Malaysian Birds

By F. N. CHASEN and C. BODEN KLOSS

1. *Terekia cinerea* (Guld.).

A recent Key¹ for the differentiation of western and eastern races is:—

A. Larger and darker; culmen 44—53 mm. *T. c. cinerea*.

B. Smaller and paler; culmen 35—44 mm. *T. c. javanica*.

Dr. C. B. Ticehurst is sceptical about the existence of two races and the material before us (consisting of seventeen skins from Siam, the Malay Peninsula and the Natuna Islands) tends to confirm his doubts² mainly because the culmens give a range of 45.5—53 mm., which forces all our *eastern* birds into the *western* race (fide Baker).

We can, however, find no confirmation of Baker's statement that the culmen range of eastern birds is as small as 35—44 mm., and cannot but think some mistake has been made.³

Ticehurst's range for "Far East" material is 44—51, which is in close agreement with our own, while he gives for a European series 43.5—49: so that if there is any difference between western and eastern birds it seems that the latter have the bill slightly longer, rather than much shorter, than typical European material. This trifling greater length does not seem sufficient reason for the recognition of an eastern race (*Totanus javanicus* Horsf.).

Our small series seems to show that females have rather longer bills than males, a feature supported to some extent by the measurements published by Riley⁴ and in part by Ticehurst⁵.

Of our birds ten males and five females have culmens respectively 46.5—51 and 51—53 mm. Two others (sexed as females by native collectors) have the culmens 45.5 and 47 mm. It may be there is no real sexual difference in the size of the bill; or, on the other hand, the short-billed females (?) may be wrongly sexed. Assuming this last, the bills of our series are:—males 45.5—51, females 51—53 mm.

¹ Baker, Fauna Brit. Ind., Birds, 1929, VI, p. 212.

² Journ. Bombay N. H. Soc., 34, 1930, p. 486.

³ The only culmen of less than 43.5 we have been able to find is one of 39 mm. recorded from the Amur River (Schrenck).

⁴ Proc. U. S. Nat. Mus., 54, 1919, p. 615.

⁵ Ibis, 1924, p. 125.

2. *Leptorodius gularis asha* (Sykes).

Moulton, following Shelford, includes the Indian Reef Heron in his list of Bornean birds¹ but the species is not otherwise known further East than Ceylon. We were rather doubtful of the identification which we therefore asked the Curator of the Sarawak Museum to confirm. Mr. E. Banks replies that the skins on which the record was founded are those of *Ardea sumatrana* Raffles.

3. *Leptoptilos javanicus* (Horsf.).

Mr. A. E. Coope has forwarded to us an interesting account of the breeding of this stork in the State of Johore in the south of the Malay Peninsula.

Mr. Coope reports that the Colony is situated in a mangrove swamp about a mile from the mouth of the River Sarang Buaya near the Muar-Batu Pahat boundary on the west coast of the State and was visited with some Malays (to whom *Leptoptilos* is known as the "burong-babi" or pig-bird) on 24th March, 1930.

There were four nests in one "ipil" tree and one in another: the trees were on a patch of slightly higher ground evidently not covered at high tide. The tree with the four nests was about 45 feet high and the other somewhat higher, about 60 feet.

A Malay climber reported one young bird in each nest, all in the downy stage except one almost fully fledged. In one nest there was a dead eel.

The parent birds flew round the climber but showed no inclination to attack.

The nests were of the usual type and unlined.

4. *Pernis apivorus ptilorhyncus* (Temm.).

A female nestling honey-buzzard was taken near Bau in the lowlands of Sarawak on 25th September, 1926. Mr. E. Banks, Curator of the Sarawak Museum, had the bird in captivity for a time and the skin before us is stated by him to have just completed its moult from a down plumage.

Although so young this bird has a crest 50 mm. in length and the plumage is very dark.

Top of the head, lores, crest and hind neck black lightening to between clove-brown and black on the mantle, scapulars and underparts and becoming dark clove-brown on the wings. Tail bands mottled with brownish grey and white. Thighs indistinctly barred with buff.

¹. Journ. Straits Branch Roy. Asiat. Soc., 1914, p. 140.

This bird represents one of the southern, crested, resident races of *Pernis apivorus*. *P. a. ruficollis* of India and *P. a. steerei* of the Philippine Islands are others. Within the range of these resident forms larger, crestless races from the north are found at certain seasons.

5. *Asio flammeus flammeus* (Pontopp.).

A short-eared owl was killed on the coast of Singapore Island in January 1930.

We have no comparative material but on description the bird appears to belong to the typical form and not to the far eastern *leucopsis* (Brehm.).

The first recorded Malayan specimen, also from Singapore, was mentioned by H. N. Ridley in Journ. Straits Branch Royal Asiatic Society, 35, 1901, p. 105 as the short-eared owl, *Asio accipitrinus*. This seems to be the bird at one time said to be in the Raffles Museum but no longer there.

It also appears to be the *Asio otus* of Robinson's "Hand-list of the Birds of the Malay Peninsula" (Journ. Fed. Malay States Mus. 2, 1907, p. 72), of the same author, op. cit., 6, 1915, p. 67; and of Chasen's list of Singapore birds in "The Singapore Naturalist", 2, 1923, p. 97 for we know of no record of the long-eared owl from the Malay Peninsula.

Asio flammeus must apparently be regarded as a casual and rare migrant in the Malay Peninsula. Wing about 320 mm.

Five New Malaysian Birds

By F. N. CHASEN and C. BODEN KLOSS

***Macropygia ruficeps malayana* subsp. nov.**

Nearest to *M. r. sumatranus* Rob. and Kloss¹; but the adult male with the white tips to the breast feathers very conspicuous as in the Bornean race, *M. r. nana* Stresemann.² On the series the head darker, more chestnut and less buffy, especially on the sides, than in *sumatranus*.

Type.—Adult male, collected on 26th February, 1908, at the Semangko Pass, Selangor-Pahang boundary, Federated Malay States. Altitude between 2,500—4,500 feet. Selangor Mus. No. 461/08 (Native Coll.) Wing 141 mm.

¹ Journ. Straits Br. Royal Asiatic Soc., 80, 1919, p. 77; Gunong Talaman, Ophir district, West Sumatra.

² Nov. Zool. 20, 1913, p. 311, Mt. Kinabalu, British North Borneo.

Specimens examined.—Twelve males and eight females from the Malay States compared with seven males and two females from West Sumatra (*sumatranus*); nine males and three females of *nana* from the type locality (Mt. Kinabalu in North Borneo); a good series of both sexes of the typical form from Java; and five *assimilis* from Western Siam.

Remarks.—Although recognizing that the form of *M. ruficeps* inhabiting the Malay States was not the same as the larger, less rufous *M. r. assimilis* Hume,¹ which is not known from further south than Raheng in West Siam² and the type locality in the hill country N. E. of Moulmein, it is only the recent acquisition of an exact topotypical series of the North Bornean sub-species *nana*, which the Malayan bird was thought to resemble, that has enabled us to name the latter. We find that *nana* is quite distinct, and from its adult male the male of *malayana* differs in having the upperparts of a brighter, more chocolate brown, especially on the lower back and rump; the head darker, more chestnut and less buffy and the underparts more deeply coloured, especially on the under tail-coverts.

Malayan females also have the upperparts brighter and less blackish brown and the underparts more deeply coloured; but the colour of the head of females is the same in both races.

M. r. malayana is perhaps rather larger than *nana*, as indeed it should be: ten males have the wings measuring 140—149 mm. and eight females 137—143 mm. against 136—143 mm. and 132—138 mm. for nine males and three females of *nana*.³

The subspecies of *M. ruficeps* are fairly well defined though one or two males of *malayana* are very near to *sumatranus* and on the available material, which only includes two from Sumatra, we should not care to separate females of the two forms. One male of the Bornean form from Kinabalu is perhaps not separable from males of *malayana*. It is not certain that the Sarawak bird is strictly the same as *nana* but our material thence is not good.

The birds recorded from French Laos as *M. r. ruficeps*⁴ by Delacour and Jabouille are probably not the typical form described from Java which, on account of the absence of black spots on the underparts of the adult male, needs no comparison with other Malaysian races.⁵

¹. Stray Feathers, 2, 1874, p. 441.

². *Vide* Chasen and Kloss, Journ. Siam Soc., Nat. Hist. Suppl. 7, 1928, p. 156.

³. Stresemann (l. c. s.) gives a series of measurements but does not separate the sexes which is unfortunate as males seem a little larger than females.

⁴. Archives d' Histoire Naturelle, 3, 1927, p. 17.

⁵. But we have not seen *simalurensis* Richmond from Simalur Island, West Sumatra, which may be unspotted below.

An apparent gap in the distribution of this species is noteworthy: no specimen seems to have been recorded from between Moulmein (*assimilis*) and Province Wellesley (*malayana*).

***Pyrotrogon fasciatus impavidus* subsp. nov.**

Pyrotrogon kasumba Chasen and Kloss, Bull. Raffles Mus., 4, 1930, p. 28.

Pyrotrogon fasciatus kasumba Kloss, Treubia, XII, 1930, p. 403.

Like *P. f. kasumba* (Raffles) of Sumatra but smaller.

Type.—Adult male, collected at Bettotan near Sandakan, British North Borneo on 6th August, 1927, by C. Boden Kloss and F. N. Chasen.

Total length 288; tail 164; wing 134; tarsus 13; bill from gape 27 mm.

"Iris dark; bare skin round the eye blue; bill blue; culmen and tip black; feet plumbeous".

Specimens examined.—Three males (including the type) and four females from British North Borneo, two males and two females from East Borneo.

Remarks.—For some time past we have realised that the continental and Bornean races of this trogon were different. The wing-range of a good series from the Malay Peninsula is 143—151 mm. (139 mm. once) but Bornean birds run smaller, 132—140 mm. We have seen no examples from Sarawak.

Sumatran specimens are rare in collections but the few skins examined indicate that they are no smaller than Malayan birds. A male from Indrapura (Jacobson coll.) has a wing of 143 mm., another male from the Lampongs (British Museum) measures 145 mm., and a female from Langkat (Van Heyst coll.) 155 mm., giving 143—155 mm. for the wing-range of the typical race.

***Penthoceryx sonnerati malayanus* subsp. nov.**

Smaller than the typical Indian form which extends to Central Tenasserim, but of much the same colour. More brightly coloured than the Sumatran race *P. s. fasciolatus* (S. Müll.) which occurs also in the extreme south of the Malay Peninsula.¹

Type.—Adult (sex inc.) collected at Kuala Lumpur, Selangor, Federated Malay States on 31st May 1910 by C. Boden Kloss.

Wing 111 mm.

¹ *Cuculus fasciolatus* S. Müll., Verh. Nat. Ges. Land-en Volkenk., 1843, p. 177, Java and Sumatra. Type locality restricted to Sumatra by Robinson and Kloss, Journ. Fed. Malay States Mus. VIII, Part 2, 1923. pp. 336. 359.

Mr. Stuart Baker has applied *Cuculus venustus* Jerdon, to this bird (Bull. B. O. C. XXIX, 1919, p. 46) but a reference to the passage in which the name was suggested (Madras Journal, XIII, Part II, 1845, p. 141) shows that it was proposed for the bird of the West Coast of Peninsular India. A specimen from Malacca mentioned at the same time was referred to *pravata* Horsf.

The name is a nomen nudum and was later made a synonym of *Cuculus sonneratii* by Jerdon (Birds of India, 1, 1862, p. 325).

***Aegitina tiphia singapurensis* subsp. nov.**

Like *A. t. tiphia* (Linn.) of Bengal but the upperparts of the male in "breeding plumage" usually much blacker, therein approaching *multicolor* Gm., of Ceylon.

Type.—Adult male collected on Pulau Ubin, an islet in the Straits of Johore near Singapore on 26th February, 1921, by P. M. de Fortaine. Coll. Raffles Museum. Wing 64.5 mm.

Remarks.—The type locality of *A. tiphia* is Bengal where breeding males are usually patched in varying degree with black on the upper parts.

As long ago as 1877 (Stray Feathers, V, p. 439, et seq.) Hume pointed out in considerable detail that males with the entire nape and back black, or relatively heavily marked with black above, become commoner as one proceeds south down the Malay Peninsula until "at Singapore the majority, I believe, of the males when in breeding plumage exhibit a considerable amount of black on the upper surface, and some at any rate occur (how rarely or how commonly I cannot say) of the purely typical *zeilomica* [= *multicolor*] type".

But the south Malayan race is not the same as that inhabiting Ceylon: *multicolor* is even more constantly and completely black above, it has less white in the wings and the green parts of the plumage are rather darker.

The series before us shows that even as far south as Singapore the black plumage is not invariably assumed and the bird we have selected as a type has the mantle largely green.

It is difficult exactly to define the range of *singapurensis* but it should be considered as extending from Singapore Island at least as far north as Klang in Selangor from which locality we have seen a bird with very black upperparts.

In a good series of males from Bengal and French Indo-China in the British Museum the large majority of specimens are uniformly green above: a few have odd black feathers on the crown and mantle. In a series from Mt. Victoria, Chin Hills, Western Burma the males have black crowns and mottled mantles and there

are also males with a fair amount of black on the upperparts from Rangoon, Tavoy, Bangkok and from localities in the North of the Malay Peninsula about Lat. 8 N., but from this latter area many males are also entirely green.

Hume's series of males from Malacca (t. c. p. 452) are typical of *singaporensis*:—"All showing more black than in typical *tiphia*, and none in quite the full *zeylonica* plumage".

Although so ill-defined we consider that this race is worth recognition. It and *multicolor* are instances of the interesting feature of parallel development, or convergence of races which occurs at the extremities of the Ceylon—Burma—Malayan arc.

***Pteruthius flaviscapis robinsoni* subsp. nov.**

Like *P. f. aeralatus* Tickell, as represented by specimens from North Siam; but the male with the grey of the back and rump darker and the sides of the abdomen more washed with pink: throat bordering chin and cheeks whitish: foreneck and breast pale grey. Size rather smaller.

Type.—Adult male collected on Mt. Kinabalu, North Borneo, 7,200 feet, on 29th March, 1929, by F. N. Chasen.

Total length 155; tail 54; wing 75; tarsus 24; bill from gape 20 mm.

"Iris bluish-grey; maxilla black, tomia at base bluish-slate; mandible bluish slate; feet fleshy".

Specimens examined.—Eight males and six females from Mt. Kinabalu.

Remarks.—We have not seen exact topotypes of *aeralatus* from Tenasserim, but have compared the Bornean race with the most northerly specimens available as birds from the Malay Peninsula are not quite typical of *aeralatus* but are ranging towards the Sumatran *cameranoi*.

This latter race is quite distinct. The underparts of the male are much washed with grey and the females are very dark buff below: *cameranoi* is also characterized by its small bill.

The pink colour of the posterior flanks is probably fugacious in some degree, but we do not think that this accounts for the marked difference in the specimens compared above.

Bornean birds have the wings measuring 73–78 mm. against 76–80 mm. in birds from the Malay Peninsula and Siam.

A note left by the late Mr. H. C. Robinson, indicating its distinctness, drew our attention to this bird.

A Contribution to the Zoology of Mangalum Island, North-west Borneo

INTRODUCTION

By C. BODEN KLOSS

The islet of Mangalum lies near the twenty-five fathom contour-line surrounding Borneo and about thirty miles west-north-west from Jesselton. Nearly circular in shape and about a mile and a half in diameter its surface is very flat and it rises but a few feet above high-water-level except in the centre where there are a few hillocks, thirty to forty feet high, surrounded by swamp in which grow Sago-palms. Numerous little streams of brown, but drinkable water reach the sea from the central swamp: most of them occur in the southern parts of the island.

Except for a little grass-land above some of the beaches Mangalum is covered with forest in which a few clearings on the west coast have been made by recent settlers from Borneo and elsewhere by a prospecting company which sank shafts for oil. It is surrounded by coral: the reef is narrowest on the south and south-east where a close approach is afforded, but is about a mile wide on the northern shore.

The best landing place in the South-west monsoon is above the south-east point: in the winter monsoon the south shore is most easily accessible.

The vertebrate fauna is poor, it does not include even a squirrel: but from a study of its Dragon-flies Dr. Laidlaw thinks that Mangalum once formed part of Borneo. Soundings in the vicinity are few, but it may certainly once have extended to the Saracen Bank, ten miles to the westward, though in Malaysian seas it is unusual for an island of the size it would then have been to be entirely without hills. At present it gives the impression of being gradually eaten away by the sea, for fallen trees are lying across its sand beaches with their heads in the water.

The presence in the forest of a large ship's anchor at a spot 220 yards due north of the south-west point of the island is curious. It suggests fairly recent elevation in the locality.

Whatever the past history of Mangalum may have been it is now an interesting spot for intensive investigation. It is a pleasant little island and though its tree-tops are only visible from a small vessel from a distance of ten miles it is easily reached from Jesselton.

MAMMALS

By C. BODEN KLOSS

Pteropus hypomelanus tomesi Peters.

A single example of this Fruit-bat was observed feeding in the forest about ten o'clock one morning. Flying foxes of this species are much more solitary and diurnal in habit than those of *P. vampyrus*.

There is a specimen in the British Museum from "Mergalum" Island which was obtained by A. H. Everett in April, 1892.

The race is recorded from small islands round the coast of Borneo from Sarawak to Sibutu and also from Lambuyan, off south Palawan. The type locality is Labuan.

Rattus rattus mangelumis subsp. nov.

A white-bellied forest, or field rat, only differing from *R. r. jalorensis* (Bonh.) of the Malay Peninsula, Sumatra, and Sarawak in having smaller audital bullae.

$$\begin{array}{r} 2 - 2 \\ \text{Mammæ} \frac{\quad}{3 - 3} = 10. \end{array}$$

Specimens examined.—Four adult males and one adult female: three subadult males and three subadult females. Numbers, R. M. 3602—3612.

Type.—Adult male (skin and skull) collected on Mangelum Island, N. W. Borneo on 11th July, 1928 by C. Boden Kloss. No. R. M. 3608.

Such examples of *Rattus rattus* as I have seen from the parts of Borneo most adjacent to Mangelum Id., are not *R. r. jalorensis*, but have grey underparts.

In 1918 Robinson and Kloss came to the conclusion that the forest *Rattus rattus* of the Malay Peninsula, Sarawak, south Borneo and Sumatra were inseparable and therefore then and subsequently recorded all as *R. r. neglectus* (Jentink), a name that antedates *jalorensis*¹. But recently Dr. K. W. Dammerman² made a careful examination of the type of *Mus neglectus* and has found it to be a house-rat not separable from *Mus diardi* Jentink, which has page priority. The name *jalorensis* must therefore come into use once more.

Bonhote's *griseiventer*, however, must give way to *diardi* as in 1921³ I found that the grey, or rusty-bellied, house rat of Malaysia could not be separated into geographical races. This rat also occurs further east in Sumbawa, Sumba and Batjan Islands. With it have gone eastwards two other house-frequenting rodents:—*Rattus concolor* and *Mus musculus*.

¹ Journ. Fed. Malay States Mus., VIII, Pt. 2, p. 54.

² Treubia, X, 1928, p. 307.

³ Treubia II, p. 120.

Measurements of *Rattus rattus mangalumis* in millimetres.

No.	Sex.	Head and Body	Tail	Hind foot, s.u.	Ear	SKULL					
						Greatest length	Condylabular length	Diastema	Upper Molar row : alveoli	Length of palatal foramina	Zygomatic breadth
3602	♂ ad.	178	185	36	19	42	36.8	11.2	7.0	7.7	20
3603	♂ ad.	181	198	35	...	41.3	36.1	12.2	6.6	8.0	20
3604	♂ ad.	179	...	36	20	42.2	37.1	11.9	7	7.8	20.2
3608*	♂ ad.	180	170 imp.	36	19	42.4	37.3	11.9	7	7.7	21.5
3611	♀ ad.	173	190	33	19	...	37.2	12.0	6.9	7.8	21

*Type

BIRDS

For details see Kloss, Bull. Raffles Mus., 4, 1930, pp. 118—121.

The species obtained were *Megapodius cumingi* Dillwyn, *Ducula pickeringi* (Cassin.), *Myristicivora bicolor* (Scop.), *Treron vernans griseicapilla* Schleg., *Cuncuma leucogaster* (Gm.), *Leptocoma jugularis inornata* (Less.) and *Anthreptes malaccensis bornensis* Riley. C. B. K.

REPTILES and AMPHIBIANS

Several occur, but none were obtained.

The tracks and laying-places of the green turtle, *Chelonia mydas*, were common on the beaches and the few Malays who have recently settled on Mangalum frequently perambulated the shores at night in search of the shell-turtle, *Eretmochelys imbricata*.

Of Lizards *Varanus salvator* was not uncommon and a Scink (*Mabuia* sp.) and a small Gecko were seen.

No snakes were met with.

On wet nights the notes of a tree frog (*Philantus*?) were heard in the forest. C. B. K.

MOLLUSCS

The only land-molluscs met with were a few small snails resting on the leaves of a shrub. They have been determined by Dr. F. F. Laidlaw as *Leptopoma lowi* Ph. C. B. K.

Remarks on some Odonata (Dragonflies) from Mangalum Island, North-west Borneo

By F. F. LAIDLAW

[Mangalum Island is about a mile and a half in diameter, quite flat except at the centre where it rises 30—40 feet, and lies about thirty miles north-west from Jesselton, British North Borneo.]

This small collection, 49 individuals in all, representing ten species, made by Mr. C. Boden Kloss during a week spent on Mangalum Island in July 1928, can scarcely be supposed to include all the species which occur on the island.

But even if it does not give us a full acquaintance with the Mangalum fauna it is, so far as it goes, of great interest.

I am of the opinion that it supports the supposition that the fauna is not entirely composed of species which have reached the island accidentally from the mainland, but that it includes species which have inhabited Mangalum since the time when it was a part of the larger land mass now represented by Borneo; that it is in fact a relict fauna.

Of the ten species collected three probably reach the island from time to time from the mainland. These are—

Tramea limbata

Tholymis tillarga

Anax guttatus.

Of the remainder, none I think are likely to travel voluntarily or involuntarily over any considerable stretch of sea.

(I would not deny the possibility that one or more of them may have been carried to Mangalum by air currents, but I think the view that they belong to a relict fauna is at least equally tenable. A comparison with the list of the Mentawi Islands is interesting in this connection¹).

Three of them are found on the Mentawi Chain of islands off the W. Coast of Sumatra, and it is worth remark that in those islands two of these three have developed sufficient peculiarities to be recognizable as distinct races, and that one of these two is also

¹. *Vide* Laidlaw, Journ. Malayan Branch, Roy. Asiat. Soc. IV, 1926, pp. 214—233.

the one which tends to show some distinctness in the Mangalum fauna, viz. *Neurothemis terminata*. They are—

Gynacantha dohrni

Agrionoptera insignis (on Mentawi as a distinct sub-species *chalcochiton*)

Neurothemis terminata.

In the series from the Mentawi Islands the isochromatic specimens outnumber the heterochromatic, whilst the males further are distinguishable from typical *terminata* by the colour pattern of the wings.

Lastly, four of the species have not been recorded from the Mentawi Islands, and one of them has not hitherto been taken in Borneo.

Camacinia gigantea

Raphismia bispina

Lestes praemorsa

Archibasis sp.

ZYGOPTERA

Lestidae

1. *Lestes praemorsa* Selys.

2 ♀ ♀.

This species is actually an addition to the Bornean list. I have compared the specimens with examples from Coorg, in S. India, and can find no differences.

Coenagriidae

2. *Archibasis* sp. ? *melanocyana* Selys.

1 ♀.

Specimen much discoloured, but appears to be *melanocyana*.

ANISOPTERA

Libellulidae

3. *Agrionoptera insignis* Ramb. *insignis* Ramb.

6 ♂ ♂, 8 ♀ ♀.

Indistinguishable from examples from the mainland.

4. *Raphismia bispina* Hagen.

2 ♂ ♂ ad. 1 ♀ teneral.

5. *Neurothemis terminata* Ris.

3 ♂ ♂, 9 ♀ ♀ isochrom.

A very interesting series. As a rule in this species the heterochromatic females largely out-number the isochromatic form of the sex. Thus in a series of 12 ♂ ♂ and 6 ♀ ♀ from North Borneo, (Kudat, Bettotan and Samawang) all the females are heterochromatic. Ris in his monograph writes that the heterochromatic females preponderate over the isochromatic. So that it is remarkable to find that in the present series there is not a single heterochrome amongst the females.

The fact can scarcely be due to any seasonal difference, as the series from Borneo was collected in the months July—Sept. whilst the Mangalum series was taken in July.

The significance of the fact is obscure, but at least it indicates that some factor or factors are acting in one habitat and not in the other. Protective mimicry which has been invoked as an agent in the case of dimorphic females of various species of *Papilio* seems out of count here.

A second feature, one which however concerns only the three males and is therefore only to be noted as a fact, is that all of them have a more extensive pigmented area on the wings than in average males from the mainland. The pigment extends just beyond the level of the pterostigma. One male from Kudat shows equally extensive pigmentation.

6. *Tramea limbata* Desjardins.

1 ♀.

Belongs to the Bornean form of the species.

7. *Camacinia gigantea* Brauer.

9 ♂ ♂, 1 ♀.

8. *Tholymis tillarga* Fabr.

1 ♂.

Aeschnidae

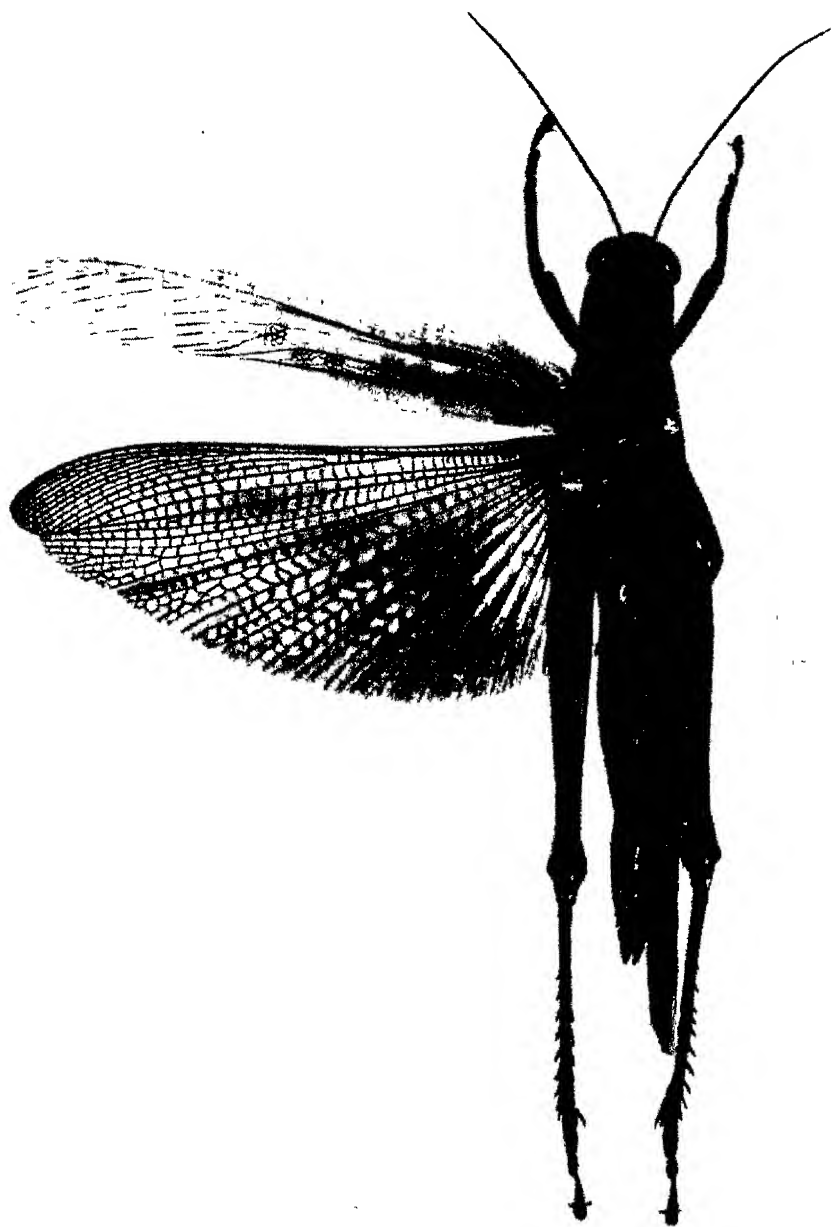
9. *Gynacantha dohrni* Kruger.

2 ♂ ♂, 1 ♀.

Recorded from Sumatra and from Sintang, Borneo.

10. *Anax guttatus* Burm.

1 ♂, 1 ♀.



Valanga nigricornis mangalumensis
Willemse, subsp. nov. Type ♂.

Orthoptera (Acridiidae) from Mangalum Island, North-west Borneo

By C. WILLEMSE

(Plate IV)

[Mangalum Island is about a mile and a half in diameter, quite flat except near the middle where it becomes 30—40 feet high, and lies about thirty miles north-west from Jesselton, British North Borneo.]

Subfam. Catantopinae

Valanga nigricornis Burm. subsp. **mangalumensis** subsp. nov.

General coloration greenish or greenish-yellow. Head with bluish-black markings. Pronotum with two indefinite blackish lateral fasciae on its disc, lateral lobes of pronotum, epimerum of meso- and metathorax with some dark bluish round spots.

Elytra greenish-yellow, in the basal half with indefinite dark spots, also in the apical half but the spots are smaller. Wings distinctly infumate with the base rose. Hind femora yellow with two sharply indicated dark bluish fasciae on the upperside and partial on the area interno- and externomedial; a dark bluish spot at the base and a more or less complete bluish praegenicular ring, besides keels with small round bluish spots. Hind tibiae from above bluish-black, from beneath more yellowish-green; spines yellow with black tips.

Length of body	♂	50 mm.	♀	59—60 mm.
„ „ pronotum	11	„	13—14	„
„ „ elytra	45	„	52—61	„
„ „ hind femora	28	„	33—34	„

This subspecies resembles the typical form and the subsp. *saravakensis* Uvarov, differing from the first by the less coarsely punctured pronotum and the colour of the elytra and from the latter by the colour of the hind femora that in *saravakensis* is unicolorous or with indefinite dark spots.

Locality: Mangalum Id., N. W. Borneo, 5 ♂♂, 9 ♀♀. 9—15 July 1928. Coll. C. Boden Kloss.

Catantops splendens Thunb.

1 ♂, 4 ♀♀. 9—12 July 1928.

Catantops humilis Serv.

1 ♂, 3 ♀♀. 9—15 July 1928.

Subfam. Tryxalinae

Aiolopus tamulus Fabr.

1 ♀. 9 July 1928.

Rhopalocera from Mangalum Island, North-west Borneo

By H. M. PENDLEBURY, *F. M. S. Museums*

(Plate V)

The following sixteen species of butterflies were taken by Mr. C. Boden Kloss, Director of Museums, S. S. and F. M. S., between July 8th—15th 1928 on Mangalum Island which is about thirty miles North-west of Jesselton, British North Borneo.

The collections obtained are most interesting, considering the small size of the island (less than a mile and a half in diameter and quite flat except at the centre where it rises to 30—40 feet) which should therefore have a very restricted fauna. The occurrence of *Libythea geoffrey* Godt., is especially noteworthy as the species is not known from the mainland of Borneo. In fact it is chiefly an Austro-Oriental species, but has a continental branch in Tenasserim and the Laos States.

It is found again in Palawan and the Philippines, but the Mangalum island form is very closely allied to the Palawan form. Another interesting capture is a series of *Papilio empedocles* F. which is a comparative rarity in Borneo, though apparently quite common on Mangalum.

I have purposely refrained from making any new races out of this material as I have none of the closely allied forms for comparison and have had chiefly to rely on descriptions, some of which are not entirely adequate unless one has access to the type specimen.

Family **Nymphalidae**

Sub-family **Danainae**

1. **Hestia leuconoe chersonesia** Frhst. (P. V, fig. 1).

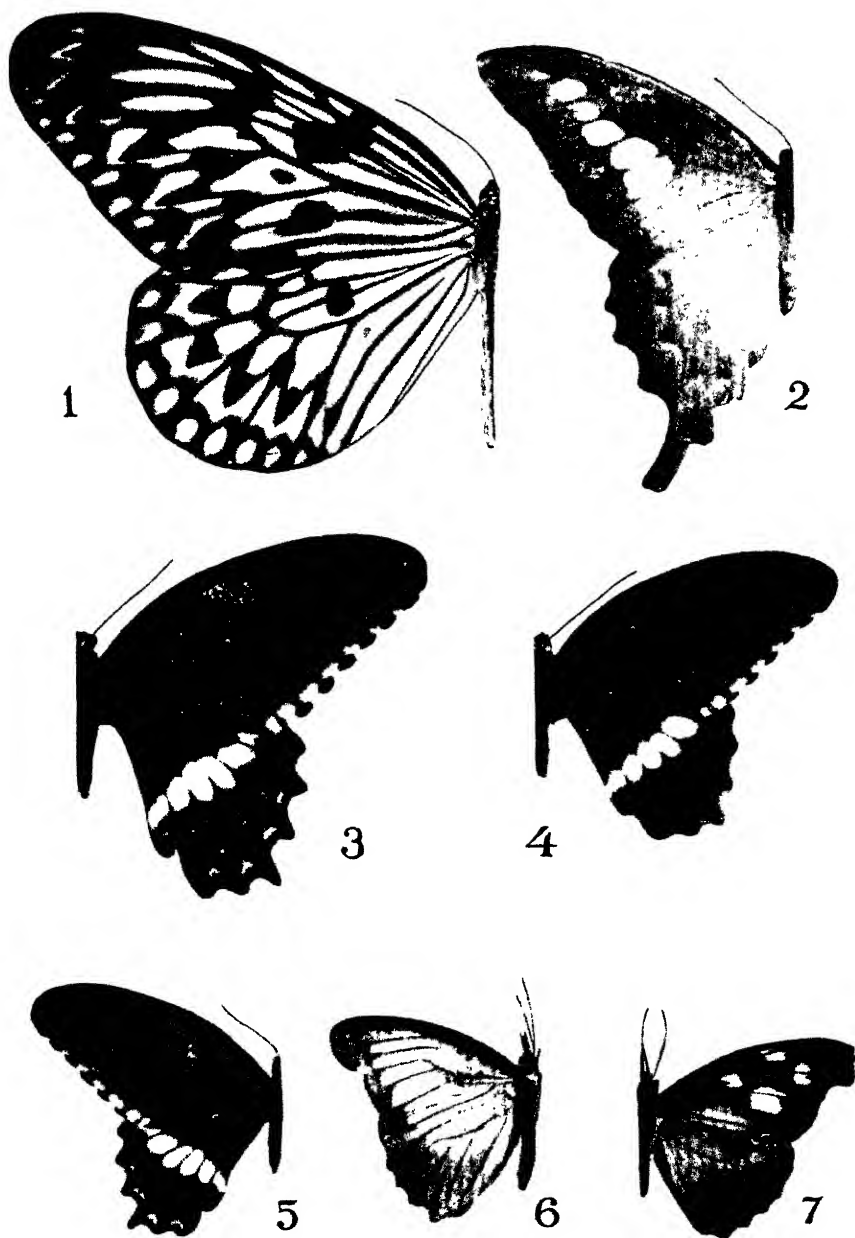
Fourteen specimens of this littoral species were collected. They are the melanotic form similar to that found on the north coast of Borneo, and which Grose Smith described as *nigriana*. The invalidity of this latter name has been dealt with by the late Dr. J. C. Moulton (Sarawak Museum Journal, Vol. II, Part II, p. 201, September 1915).

2. **Danaida lotis mezentius** Frhst.

Twenty-five ♂♂, 7 ♀♀. On the average these are slightly larger (length of forewing 42 mm.) than those on the Bornean mainland (length of forewing 38 mm.).

3. **Danaida similis vulgaris** Btlr.

Twenty-four specimens, typical.



Rhopalocera from Mangalum Island.
Northwest Borneo.

Sub-family **Satyrinae**

4. *Ypthima pandocus* Moore.

Seven specimens. Length of forewing: ♂ 20, ♀ 20—22 mm. This may be a new race, more closely allied to *Y. p. calanus* Frsht., from Jolo Id., Sula Group than *Y. p. jamaeus* Frsht. from Banguay Island.

It appears to differ from the former only by the darker coloration of the underside, and from the latter by the larger eyespots. In all the specimens before me there is a small accessory apical eyespot, or an indication of one, on the underside of the hind wing. I have some rather similar specimens from Kudat on the Bornean mainland (Sept. 1st—18th 1927) which differ, however, in the smaller subanal ocellus on the hind wing above.

Sub-family **Nymphalinae**

5. *Cupha arias cacina* Frhst.

Thirteen specimens, rather darker but otherwise agreeing with Fruhstorfer's *f. pseudarias*, described from a dry season form on Mantanani Island.

Family **Papilionidae**

6. *Papilio polytes* (?) *valeria* Jord. (Pl. V, figs. 3, ♀ ; 4, ♂ ; 5, ♀).

I have referred a long series of 40 ♂ ♂ and 12 ♀ ♀ to Jordan's form: *valeria* which he described from 3 ♀ ♀ from Mantanani Ids. We have two ♂ ♂ only from Mantanani Ids. (presumably ♂ ♂ of *valeria*) and these are very similar to the Mangalum Id. ♂ ♂ which differ however by the rather thicker marginal spots on the forewing above, and in the spots on the discal band of the hind wing above being slightly narrower than those of the Mantanani Ids. form, especially spot two from the costa which is almost quadrate. ♂ ♂ and ♀ ♀ similar in pattern, variable in size. The ♀ ♀ differ from the description of *valeria* Jord., in that the second discal spot on the hind wing above and below is longer than broad. Marginal spots on hind wing above at least four visible (excluding the red anal spot), these are reddish or whitish-yellow. Length of forewing: ♂ ♂ 40—54 mm.; ♀ ♀ 44—58 mm.

7. *Papilio memnon memnon* L.

Nine ♂ ♂, typical. 7 ♀ ♀, *f. laomedon* Cr. Distributed throughout Borneo, also on the Natuna Ids. Banka, and Java.

8. *Papilio empedocles* F. (Pl. V, fig. 2).

Eleven specimens. The occurrence of this butterfly on Mangalum Id. is of especial interest, as it is generally only found in hilly country, and then only taken singly. It is known from the Malay Peninsula (rare) Sumatra, Batu Ids., Java, Banka, Borneo and Palawan.

Family **Pieridae**

9. **Appias albina** Bsd.

Two ♂♂, 2 ♀♀. This race seems to be *A. a. confusa* Frhst., the ♀♀ are ♀—*f. principalis* Frhst.

Family **Erycinidae**

10. **Libythea geoffrey philippina** Stgr. (Pl. V, fig. 6, ♂; 7, ♀):

This is a most interesting species and has yet to be found on the mainland of Borneo. Thirty-six specimens were taken of which 18 were males. I have not seen specimens of *philippina* Stgr., described from Palawan, but from Staudinger's description (Iris, Band II, pp. 87—89, 1889) and the figure in Seitz' *Macrolepidoptera of the World* (Vol. IX, pl. 139, g.) I can find no constant distinguishing character except the size: in coloration and markings they appear to be exactly alike. Staudinger gives the size of the Palawan specimens as varying in expanse from 42—48 mm. The Mangalum Id. specimens are constantly larger: ♂♂ 51—59 mm., average 55.3 mm. ♀♀ 52—59 mm. average 55.4 mm.

Family **Lycaenidae**

These three species were kindly determined by Brigadier W. H. Evans, C.I.E., D.S.O., of Quetta, India.

11. **Chilades calyptra** Frhst.

Four ♂♂, 12 ♀♀. "So far only recorded from Palawan, obviously a race of *lains* Cr."

12. **Chilades cleotas mindora** Fldr.

Eleven ♂♂, 6 ♀♀. "Normal."

13. **Nacaduba atrata nemana** Frhst.

One ♂. "Very like the Indian form: *prominens* Mre."

Family **Hesperidae**

14. **Ismene harisa** Mre.

Ten ♂♂, 1 ♀. This species generally flies at dusk, and in the early morning.

15. **Gangara thyrsis** F.

One ♀. A worn specimen.

16. **Taractrocera ziclea** Pl.

One ♂.

Figures on Plate V.

1. *Hestia leuconoe chersonesia* Frhst.
 2. *Papilio empedocles* F.
 3. *Papilio polytes* (?) *valeria* ♀.
 4. " " " ♂.
 5. " " " ♀.
 6. *Libythea geoffrey philippina* Stgr. ♂.
 7. " " " ♀.
-

A Preliminary note on some Insects from Mangalum Island, North-west Borneo

By H. M. PENDLEBURY, *F. M. S. Museums*

With regard to the insects collected by Mr. C. Boden Kloss on Mangalum Island (8—15th July, 1928) that have not yet been reported upon in this series of papers, it is evident that there are several interesting species.

At present it is not possible to put a definite name to every specimen in a general collection like this, as the species are spread through several orders and often belong to families or genera which are either undergoing revision, or about which very little is known.

Several of the species also appear to have no close affinities in the Malay Peninsula, and with the exception of a few which are widely distributed throughout the Oriental Region I have made no attempt at specific determinations: further study will doubtless reveal several new races. This paper therefore is only intended to give a rough indication of the insect potentialities of a little island with a fauna hitherto unknown. The island is less than a mile and a half in diameter and is quite flat (except in the middle where there is a small area about 30—40 feet high) and lies some thirty miles to the north-west of Jesselton, British North Borneo.

ORTHOPTERA

Blattoidea: (Three specimens; two species).

Chorisoneura lativittata Wlk.

Neoblattella irregulariter-vittata Brunner.

Tettigonoidea: (Eight specimens; four species).

Xiphidion maculatum Le Guill. var.

Psyra melanonota Stal. var.

? *Psyra* sp.

Xiphidiopsis sp.

Grylloidea: (Nine specimens; four species).

Cardiodactylus sp.

Aphonomorphus sp.

Ornebius sp.

Lebinthus sp.

NEUROPTERA

Myrmeleonidae: (Two specimens; one species).

Neuroleon ? *perniciosus* Wlk.

Mr. Nathan Banks who examined this species writes "it agrees fairly well, but may be distinct".

ISOPTERA

Termitidae

One winged specimen, not in good condition.

HEMIPTERA

Pentatomidae (one specimen).

Glaucias sp.

Hydrometridae: (Twelve specimens; one species).

Gerris anadyomene Kirk.

Cicadidae: (Six specimens; one species).

Ayesha spathulata Stal.

Fulgoroidea: (Twenty-eight specimens; six species).

Mindura sp.

Pochazia obscura F.

Phyllophanta producta Stal.

Delphax sp.

Hemisphaerius sp. nr. *bipunctatus*.

Issid.

Jassidae: (Fifteen specimens; two species).

Tartessus ferrugineus Wlk.

Petaloccephala sp.

COLEOPTERA

Cicindelinae: (Fourteen specimens; two species).

The two species were determined by Dr. W. Horn:

Collyris diardi rufitarsis Klug.

Cicindela tenuipes Dej.

Rutelinae: (Eleven specimens; two species).

Euchlora sp.

Serica sp.

Rhipiceridae: (Three specimens; two species).

Callirhipis sp.

Buprestidae: (Three specimens; two species).

"*Chrysodema jansonii auroplagiata* Deyr.

Chrysodema n. sp. nr. *dohrni*.

Dr. W. S. Fisher of the United States National Museum examined these beetles and writes as follows:—

One of the specimens of *Chrysodema* from Mangalum island seems to be a new species and I will describe it in my next paper on new species from that region. The other two examples of *Chrysodema* from the same island vary slightly from typical examples of *auroplagiata* described from Borneo, but are not sufficiently different to be considered as a new form. This is a very difficult genus and there seems to be a slight variation in the specimens from the different islands, so it is almost necessary to have a good series from each locality, including both sexes and showing the range of variation, to make accurate identifications".

Chrysomelidae: (Fourteen specimens; two species).

Phytorus sp.

Aulacophora sp.

Longicornia: (Six specimens; three species).

Dihammus sp. and two others.

Curculionidae: (One specimen).

Hypomeces squamosus F.

LEPIDOPTERA

(HETEROCERA)

Sphingidae: (Three specimens; one species).

Psilogramma menephron Cr. a dark form.

Cossidae: (Two specimens; two species).

Arctiidae: (Three specimens; one species).

Utetheisa lotrix Cr.

Noctuidae: (Twenty-four specimens; ten species).

Eriopus leucobasis Hmps.

Dinumma sp.

Stictoptera trajiciens Wlk.

Carea sp. nr. *obvia* Hmps., described from the Philippine Islands.

Spiredonia feducia form *zamis* Stoll.

Achaea serva F.

Four other species.

Hypeninae, etc. (Thirty-five specimens; five species).

Nodaria sp.

Simplicia sp.

Three others.

Geometridae: (Thirty-five specimens; ten species).

Sabaria ? *obliquilineata* Warr.

Cleora injectaria Wlk. ? race.

Sauris ? *nigrilinearia* Leech.

Ozola concreta Prt. ? race.

Noreia sp.

Scopula two species.

Thalassodes sp.

Hemithea sp.

Comibaena sp.

Thyridiidae: (Three specimens; three species).

Herimba sp.

Strigina sp.

Rhodoneura sp.

Epiplemidae: (One specimen).

Epiplema sp.

Pyralidae: (One hundred and eighty one specimens; fifteen species).

Margaronia bivitalis Guen.

M. marinata F.

M. glauculalis Guen.

M. annulata F.

Sylepta iopasalis Wlk.

Hymenia fascialis Cr.

Endotricha mesenterialis Wlk.

Herculia pelasgalis Wlk.

Cotachena histricalis Wlk.

? *Mimistis actiosoides* Hamps.

Five other species.

Tortricidae: (One specimen).

Tineina: (Ten specimens; three species).

DIPTERA

Syrphidae: (Six specimens; two species).

These two species have been determined by Mr. C. H. Curran as:

Sphalrophoria javana Wied.

Dissoptera heterothrix de Meij.

Bombyliidae: (One specimen).

Hyperalonia tantalus F. var.

Differs from the typical form in that the wings are clear at apex and the band on the third abdominal segment is broken.

Asilidae: (Eighteen specimens; three species).

Promachus two species.

Leptogaster sp.

Micropezidae: (Nineteen specimens; one species).

Calobata sp.

Therevidae: (Four specimens; one species).

Thereva sp.

Ortalidae: (Four specimens; two species).

Plagiostenopterina aenea Wd.

Scholastes cinctus Guer.

Drosophilidae: (Three specimens; one species).

Drosophila sp.

Anthomyidae: (Two specimens; one species).

Muscidae: (Two specimens; one species).

Tachinidae and Dexidae: (Twelve specimens; four species).

HYMENOPTERA

Ichneumonidae: (Three specimens; one species).

Henicospilus sp.

Scoliidae: (Three specimens; one species and variety).

Campsomeris rubromaculata borneana Cam. and variety.

Pompilidae: (Three specimens; one species).

Hemipepsis sp.

Sphegidae: (Six specimens; one species).

Notogonia subtessellata Sm.

Apidae: (Two specimens; one species).

Allodape sp.

Formicidae: (One specimen).

Winged camponotine ant.

Further records of the One-horned Rhinoceros in the Malay States

By C. BODEN KLOSS

(Plate VI)

In another local publication (Journ. Fed. Malay States Mus. XIII, 1927, p. 207, Pl. V) I recorded the existence in the Selangor Museum of two mounted heads of *Rhinoceros sondaicus* from Perak.

The one-horned rhinoceros is so rare an animal in the Malayan part of the Peninsula that it seems desirable to add to these records that of a third obtained in April, 1898, at Sungei Pelawan near Chikus, also in Perak, by the late Mr. H. C. Barnard.

The head is now in the possession of Mrs. Barnard who has given me the photograph which is reproduced in the accompanying plate.

I am indebted to Mr. B. Barnard for drawing my attention to this animal and for assistance in obtaining the photograph: he was one of the party which secured the trophy.

A fourth individual, of which the head is preserved in the Federated Malay States Police Mess at Kuala Lumpur, was shot at Ujong Permatang, Selangor, in 1927. The head was badly set up and is therefore not reproduced.

The Bearded Pig (*Sus barbatus*) in the Malay States

By C. BODEN KLOSS

(Plate VII)

The late Messrs. H. C. Robinson and J. C. Moulton in their paper "The Bearded Pig (*Sus barbatus*) in the Malay Peninsula" wrote¹.

"We owe the remarkable discovery of the Bearded Pig in the Malay Peninsula to Dr. W. S. Leicester an enthusiastic sportsman who obtained a single female specimen some years ago in the vicinity of Pekan, Pahang. The occurrence, however, was so remarkable and so at variance with preconceived ideas of geographical distribution that pending further evidence it was not considered advisable to place the occurrence on formal record. Now however that a further specimen has been obtained from the same locality there is no doubt whatever that the species must be regarded as a

¹ Journ. Straits Branch, Royal Asiatic Soc., No. 85, 1922, pp. 202—203.



The One-horned Rhinoceros (*R. sondaicus*) from Perak, Malay Peninsula.

Malayan Pigs: *Sus barbatus* subsp. and *S. scrofa vittatus*-*inubatus*.



member of the Peninsula fauna, though as noted below we think it not improbable that its presence is really due to some extraordinary change resulting in the landing of a herd from Borneo, the home of the true *Sus barbatus*, or from the Rhio Archipelago where the rather dubious race *S. barbatus oi* Miller, is found.

"In answer to queries Dr. W. S. Leicester wrote under date March 19th, 1918, in reference to the original specimen—a fully adult female: "Yes I am quite certain she was shot in the neighbourhood of Pekan. I remember a herd of this breed appeared in the neighbourhood and I shot this large sow and several half grown ones from time to time but could not get at the big boar which was very cunning and got away every time. They were some time about Pekan but eventually disappeared and I have not come across any since".

"Dr. Leicester very kindly presented this specimen to the F. M. S. Museums.

"Mr. J. E. Kempe, District Officer, Pekan, has now obtained the skull of a boar, which he has generously presented to the Raffles Museum, Singapore; he writes under date December 6th, 1921: "It was shot by Towkay Lee Cheow,—an old Pekan character who has hunted and kept a pack these thirty years—about six weeks ago at a place called Sungei Genek, some two miles up river from Pekan town. He gave me the skull and the description and told me that in all his experience extending over thirty-three years, and including the slaughter of thousands of pigs he had never seen such an animal He told me that the remarkable things about it were its great length and *height*, but what impressed him most was the fact that it had a thick tuft of hair under each eye about two inches long and a good sized beard.

"It weighed 180 katis (240 pounds) and was very emaciated. He said he thought, if in condition, it would have scaled 230 katis or more. It was a solitary boar."

"The above statement supports the suggestion that this animal was the last survivor of some herd that had gained access to the Malay Peninsula and which had not been able to maintain itself under exotic conditions. Possibly even, it was the actual boar to which Dr. Leicester refers.

"The question then arises, is this pig indigenous in the Malay Peninsula, or is this particular record the result of some fortuitous visit by an adventurous pair—perhaps from Pulo Batam, 10 miles south of the southern extremity of Johore—who established themselves for a brief period in Pahang? Native stories of a giant white pig in Johore undoubtedly refer to this species. On the whole we are inclined to think that it is not indigenous in the Malay Peninsula. Its rarity here—we know of no other examples having

been killed or seen authentically—seems to point to the fact of it being only an occasional visitor. If it were a Peninsula species in the strict sense, the geographical distribution would be difficult to explain. On the other hand one should not lose sight of the fact that under favourable circumstances sufficient individuals might reasonably come in from the Malayan Islands near the mainland and establish themselves for a noticeable period."

Mr. Kempe stated subsequently (in litt.) "This pig is perhaps an essentially forest and swamp loving animal, shunning the neighbourhood of man: if so it might exist in large numbers in the vast swamps of Bebar and the upper Rompin Rivers which are virtually unexplored" [both in south-east Pahang]: and, commenting on the view that the animals secured had come from the small islands south of Singapore [where, and in the adjacent parts of Sumatra, *Sus barbatus* is comparatively well-known]. "It is hard to believe that the animal could have found its way here from the Rhio Archipelago which would involve crossing several large rivers and areas of most abysmal swamp" Mr. Kempe was, of course, quite right in not believing that the two individuals obtained had crossed the Straits of Singapore (ten miles wide) and travelled a hundred and fifty miles upcountry to Pekan.

Later I took up the matter with the District Officer of Pekan, then Mr. W. Linehan, who wrote "The keeper of the local hunting pack (Lee Yeo Lim, goldsmith) informs me that he shot about ten whiskered pigs last year, but so far he has got none this year. He has given me a photograph of one of the animals shot last year which I send (Plate VII): the large individual is the one, the two smaller individuals are of the ordinary kind. There should be little difficulty in getting a specimen": but Mr. Linehan was then transferred and Mr. E. W. Mumford, of the Police, with whom I continued the correspondence, wrote "This breed, it seems, is fairly numerous around Pekan, but as far as I have seen adult boars are rare: out of the number we got last year none, I think, would have been sufficiently mature for your purpose. Most of the hunting done with the local pack is within a mile or two of Pekan and in this area pigs seem to have been rather scarce recently due, I think, partly to the hunting and partly to the recent hardness of the ground and general lack of water. From what I have seen the whiskered pigs seem to be most numerous during the wet monsoon [November—March] when they predominate over the other species. At other times they seem scarce, at least in the area round Pekan which can be beaten and where, due perhaps to regular hunting, adult boars appear to be very rare for I have not seen one in eighteen months. I hope to get a specimen for you further up-river".

But Mr. Mumford also, like Mr. Linehan, was soon transferred and was unable to make good his offer of assistance: and thus the matter stands at present.

When writing my paper on "Malaysian Bearded Pigs" I deliberately refrained from mentioning the Leicester material, feeling that such evidence alone was hardly sufficient to prove the occurrence of *Sus barbatus* in the Malay Peninsula, but Mr. Kempe's example and the photograph of the animal in the flesh, together with the additional testimony, place the matter beyond doubt.

* * * * *

On the plate accompanying this article I have referred to the common wild pig of the southern part of the Malay Peninsula as *Sus scrofa vittatus* > *jubatus*. *Sus vittatus* Müll. and Schleg., is the Sumatran animal, *Sus jubatus* Miller, is the animal inhabiting Peninsular Siam and Tenasserim. The pig of Johore, at the south extremity of the Peninsula has been separated by Miller as *Sus peninsularis*.

Apparently in Johore and in Singapore Island occurs an unstable pig: in part approximating to, or being, *vittatus*; in part approximating to *jubatus*. These latter are *peninsularis* having, on the whole, more complicated and larger molars and broader parietal constriction (or narrower nasals) than *vittatus*: but the width of the palate is unstable. *Sus peninsularis* does not fairly represent the local pig population, but only part of it.

A new sub-species of Malaysian Rat

By C. BODEN KLOSS

Considering how systematically the Malay Peninsula—and more especially the Malay States of its southern portion—has been trapped for small mammals I was much surprised to receive last year from the Institute of Medical Research, Kuala Lumpur (through Mr. B. A. R. Gater) three examples of a rat entirely unknown to me; while early this year Mr. E. Banks, Curator of the Sarawak Museum, obtained and forwarded two more examples from the neighbourhood of Kuching—also a locality well explored zoologically. This rat seems to be related to the animal from the Banjak Islands, N. W. Sumatra, for which Miller has proposed the genus *Lenothrix* (Proc. U. S. Nat. Mus., xxvi, 1903, p. 466, pl. xviii: *Lenothrix canus* gen. et sp. nov.). It is considerably smaller, however, and differs in other characters.

***Rattus canus malaisia* subsp. nov.**

Diagnosis.—Upper pelage mixed with long piles but quite devoid of flattened spines; under parts creamy white sharply margined; hind-feet short and broad; tail black proximally, distally white throughout for half or two-thirds of its length where it is

¹ Journ. Straits Branch, Royal Asiatic Soc., No. 83, 1921, pp. 147—150. In this paper I inadvertently gave a name (*Sus branti*) to the Sumatran representative of *Sus gargantua* Miller, of S. E. Borneo.

fairly thickly clad with white hairs increasing towards the tip and forming a pencil.

Mammae four pairs, three pectoral and one inguinal.

Skull broad; infra-orbital plate narrow, scarcely visible viewed from above; bullae moderate, only a little more dilated than in the Malaysian spiny rats; teeth large.

Colour.—White of under parts extending to wrists, ankles and sides of muzzle. Upper parts and outer sides of limbs variable:—apparently in fresh pelage the general colour is mouse-grey¹ or hair-brown² slightly darkened along the dorsal line by the longer piles and rendered paler on the shoulders and flanks by the light buffy tips of the softer hairs, the grey bases of which are considerably exposed on the sides. Eventually the upper parts appear to “burn” or “bleach” to drab, tinged with ferruginous in places³. Hands and feet approximate in colour to the outer sides of the limbs.

Skull.—Broad; rostrum robust: nasals extending posteriorly to about the level of the orbital space; infra-orbital plate narrow, retreating as it ascends, not projecting anteriorly; frontals strongly beaded, the beading sharply angular at the fronto-parietal suture; combined palatal foramina ovoid in outline, short; interpterygoid space large, extending well between the posterior molars; bullae only moderately dilated. Teeth large and tooththrows long.

Type.—Adult male, skin and skull. Collected at Sungei Buloh, near Kuala Lumpur, Selangor, Malay Peninsula, 26th June, 1930.

Specimens examined.—Two males and a female⁴ from the type locality and a pair from Matang Road near Kuching, Sarawak, Borneo. It is noted of the latter that one was trapped in virgin forest, the other in secondary growth.

Remarks.—This species bears externally, on account of its colour and pied tail, a superficial resemblance to animals of the *bowersi-ferreocanus-berdmorei-mullulus* group with which, however, it is in no way connected. The broad skull, orange incisors and short feet are very different from the elongate wedge-shaped skull, ivory incisors and long feet of the others. The softer fur also contrasts with the more hispid pelage of the Indo-Chinese rats, only one of which extends into Malaysia (*R. ferreocanus*: mountains of the Malay Peninsula).

1. Bornean specimen, subadult.

2. Malayan specimens, adult.

3. Malayan specimen, adult.

4. Not available for the moment. It has a darkened patch on the abdomen and the white portion of the tail shorter than in the others.

ON BATS FROM THE LIMESTONE CAVES OF NORTH BORNEO

MEASUREMENTS	Selangor ♂ . Type	Selangor ♂	Sarawak ♂	Sarawak ♀ subad.
<i>Rattus malaisia</i>				
Head and body ...	190	163	175	175
Tail ...	215	223	234	221
Hind foot, s. u. ...	35	33	33	32
Ear ...	24	21	—	—
Skull:—				
Greatest length ...	43.9	44	44.5	41
Condyllo-basilar length	39.2	39	40	37
Diastema ...	12	11.5	12.2	10.9
Length of palatal for- amina ...	6	6.4	6.1	5.8
Median nasal length ...	15	15	16	14.9
Breadth of combined nasals ...	5.9	5.2	5	5
Zygomatic breadth ...	23.5	22.5	22.1	21
Upper molar row (alveoli) ...	8.1	8.8	9	8.4

On Bats from the Limestone Caves of North Borneo

By F. N. CHASEN

The collection on which this report is based was submitted for examination by Mr. H. G. Keith, Acting Conservator of Forests in British North Borneo. It was made by Senior Forest Ranger P. Orolfo at various times in 1930 in the caves of the limestone hills at Gomantong on the left bank of the Kinabatangan River about twenty miles south of Sandakan on the north-east coast and in other caves known as the Madai, Baturong and Tapadong caves near Lahat Datu in Darvel Bay on the east coast of the State. Notice of a small collection I made at Gomantong in 1929 is also included.

Such caves, which also exist in other parts of Borneo and elsewhere, are often the breeding places of small swifts of the genus *Collocalia* of which certain species produce the edible birds' nests of commerce.

In the Malay Peninsula the extensive Batu Caves near Kuala Lumpur in Selangor are in the undisputed possession of bat colonies, but in British North Borneo bats and swifts live side by side in the caves and the conduct of the former has at times caused anxiety to the Government.

Several charges have been made against the bats but none is well substantiated. They have been accused of encroaching on the areas occupied by the swifts but there is no direct evidence that this is the case. Although it is certain that in most of the larger caves the bats occupy their own particular recesses, these being in the darkest and most remote part of the cave, odd individuals can usually be seen perched near or actually among the birds and their nests and it is said that under these circumstances the nests are often accidentally dislodged by the bats. It has furthermore been suggested that this is the reason why the produce of some of the small caves on the lower Kinabatangan River is not regular. Definite offensive action on the part of the bats has also been alleged: the urine is also said to be offensive to the birds and to give a bad colour to the nests.

Far more detailed observation is necessary before any of these charges can be regarded as anything more than hearsay and any definite action taken to reduce the number of bats would at the moment be ill-advised: it should never be undertaken at any time in the absence of very cogent reasons. Mixed associations like those seen in the North Bornean caves are not uncommon. My own impression of the balance at Gomantong was that birds and bats were living in harmony and that large sections of the caves remained uninhabited by either.

Mr. Keith also forwarded the stomach contents of some bats from Gomantong. Mr. H. M. Pendlebury kindly examined these and reported that those of the large *Hipposideros diadema* contained beetles (including fragments of *Longicorna* sp.) Blattidae, Hemiptera and possibly some ants. It is also noteworthy that in the three specimens of this species examined some hair was found in the intestines. Stomach contents of *Rhinolophus creaghi* and *Hipposideros galerita* contained matter in a highly comminuted condition. Recognisable fragments included the remains of Lepidoptera, Hemiptera, Carabidae, Tenebrionidae, Blattidae, some ants and possibly a cicada.

The daily exodus of bats from a hole in the top of the cave at Gomantong is justly famous. In the late afternoon they emerge in a long ribbon-like procession. The stream is only a few feet wide and according to several independent observers it may continue uninterrupted for nearly an hour.

On the occasion of my visit it was estimated that three thousand bats left the cave every minute for half an hour giving a minimum population of 90,000. The return to the cave takes place sometime before day-break but it is said that the bats travel independently and not in formation.

Various large Accipitres are enemies of the bats. Chief among them is the Brahminy Kite (*Haliastur indus intermedius*) a number of which are usually found near the caves. The kites also prey on the swifts but the major part of their food seems to consist of bats.

The collection submitted includes the following seventeen species:—

Megachiroptera (Fruit-eating bats).

1. *Rousettus amplexicaudatus amplexicaudatus* (*E. Geoff.*).
2. *Balionycteris maculata maculata* (*Thos.*).
3. *Eonycteris spelaea spelaea* (*Dobs.*).

Microchiroptera (Insect-eating bats).

4. *Rhinolophus creaghi* *Thos.*
5. *Rhinolophus philippinensis* *Waterh.*
6. *Rhinolophus borneensis borneensis* *Peters.*
7. *Hipposideros diadema vicarius* *And.*
8. *Hipposideros galeritus galeritus* *Cant.*
9. *Hipposideros insolens* *Lyon.*
10. *Myotis* (*Leuconoë*) *horsfieldi carinatae* *Miller.*
11. *Myotis* (*Leuconoë*) *sp.*
12. *Miniopterus blepotis* *Temm.*
13. *Miniopterus witkampii* *Sody.*
14. *Emballonura rivalis* *Thos.*
15. *Emballonura monticola monticola* *Temm.*
16. *Taphozous melanopogon fretensis* *Thos.*
17. *Chaerephon plicatus* (*Buch.-Ham.*).

Most of the above species are common and well-known but there are several interesting features about the collection.

The typical form of *Eonycteris spelaea* is shewn to exist in Borneo.

Rhinolophus philippinensis has not hitherto been recorded from Borneo.

Miniopterus blepotis is another addition to the Bornean list: three species of the genus are now known from the island, *witkampii*, *medius* and *blepotis*.

The *Myotis* *sp.* also appears to represent a species unknown from Borneo but most unfortunately the only specimen sent is a skin without a skull.

MEGACHIROPTERA

1. *Rousettus amplexicaudatus amplexicaudatus* (E. Geoff.).

1 ♀ Madai Caves (No. 75).

Forearm.—80 mm.

Four skins of immature animals (Nos. 73, 74, 76, —) also appear to belong to *amplexicaudatus* but in the absence of skulls no more can be said.

Andersen's remarks concerning the occurrence of this species in the Malay Peninsula are not very clear. In Mon. Chir. I, p. lxxix, it is included with a query under "Lower Siam" and "Malay Peninsula." On p. lxxxii, *amplexicaudatus* is mentioned as being common to the three areas, the Malay Peninsula, Sumatra and Borneo but on p. 42 the first named locality is neither mentioned nor implied in the given range of the species: furthermore no Malayan specimens are listed. Actually *R. amplexicaudatus* does occur in the Malay States: specimens from the Batu Caves in Selangor are in the Raffles Museum.

2. *Balionycteris maculata maculata* (Thos.).

1 ♂, 1 ♀ Baturong Caves (Nos. 132, 133).

Forearms.—♂ 44; ♀ 42 mm.

The Malayan form of this bat is *B. m. seimundi* Kloss¹.

Dr. Dammerman² has recorded it from Pulau Durian in the Rhio Archipelago and there are unrecorded specimens in the Raffles Museum from Pulau Galang in the same archipelago.

3. *Eonycteris spelaea spelaea* (Dobs.).

6 ♂ Tapadong Caves (Nos. 445—450).

Forearms.—65, 66, 67, 67, 68 mm.

Andersen³ does not recognize *E. spelaea* as a Bornean form and considers that it is replaced in that island by the larger *E. major* And. This latter animal, however, seems to be either a distinct species or a high level form; for a bat which seems inseparable from typical *spelaea* as represented by specimens from Tenasserim, the Malay States and Singapore certainly does occur in north-east Borneo (and apparently also in Sarawak) as correctly shewn by Matschie⁴. An adult but not aged male in the present collection measures:—head and body 110; tail 12; forearm 67; pollex, total length 23; 3rd digit, metacarpal 46, 1st phalanx 29.5, 2nd phalanx 39; 4th digit, metacarpal 45, 1st phalanx 24, 2nd phalanx 25; 5th digit, metacarpal 41, 1st phalanx 20, 2nd phalanx 19; lower leg c. u. 46 mm.

¹. Journ. Fed. Mal. States Mus. X, 1921, p. 229; Pahang.

². Treubia, VIII, 1926, p. 304.

³. Ann. Mag. Nat. Hist. (8) VI, 1910, p. 625 et Cat. Chir. 1912, p. 735.

⁴. Megachir. 1899, p. 90.

Skull.—Total length 33.5; condylo-basal length 33; rostrum orbit to nares 10; zygomatic width 20; upper tooth-row to front of canine 11.4 mm.

MICROCHIROPTERA

4. *Rhinolophus creaghi* Thos.

8 ♂, 7 ♀ Baturong, Madai and Tapadong Caves (Nos. 49, 62, 63, 167, 168, 214, 215, 330, 331, etc.).

Forearms.—♂ 48, 49, 49, 49, 49, 49, 49, 51; ♀ 48, 49, 49, 49, 50, 51 mm.

This bat is also common in the Gomantong Caves. The wings arise from the tibia about a quarter of an inch above the ankle and although this is a variable feature it seems likely that the half an inch mentioned in the original description is an error.

5. *Rhinolophus philippinensis* Waterh.

6 ♂, 3 ♀ Madai and Tapadong Caves (Nos. 48, 353—360).

Forearms.—♂ 50, 50, 51, 51, 52, 53; ♀ 51, 53, 54 mm.

This is an addition to the Bornean fauna. Unfortunately no comparative material is available and the specimens have been identified entirely on description: it is of course improbable that the Bornean race is the same as that inhabiting the Philippine Islands.

The common member of Andersen's *luctus* group of *Rhinolophus* in Borneo is *R. trifolius* a species not represented in the present collection.

6. *Rhinolophus borneensis borneensis* Peters.

1 ♀ Madai caves (No. 45).

Forearm.—42 mm.

7. *Hipposideros diadema vicarius* And.

Fourteen ♂, 5 ♀ Gomantong, Baturong, Madai and Tapadong caves (Nos. 24, 25, 52—56, 58—60, 144, 145, 243, 322, 324, 340, 341, 325, —).

Forearms.—♂ 79, 82, 82, 83, 83, 84, 85, 86, 86, 86, 86, 87, —; ♀ 83, 84, 86, —, — mm.

8. *Hipposideros galeritus galeritus* Cantor.

Seven ♂, 13 ♀ Gomantong, Baturong, Madai and Tapadong caves (Nos. 17, 64, 80, 81, 159, 326, 327, 363, 364, 366).

Forearms.—♂ 45, 47, 47, 48, 48, 48, 49; ♀ 47, 47, 49 mm.

In a series of twenty-six from the Gomantong caves the forearm varies in length from 45—47 mm. with 48 mm. once and 49 mm. once. The fur is very variable in colour irrespective of sex.

9. *Hipposideros insolens* Lyon.

Hipposideros insolens Lyon. Proc. U. S. Nat. Mus. 40, 1911, p. 129: Lowatsi, upper Pasir River, south-eastern Borneo.

Three ♂, 5 ♀ Baturong caves (Nos. 117—120, 160, 169, 234, 235).

Forearms.—♂ 48, 48, 49.5; ♀ 49, 49, 49.5, 50, 50 mm.

When skins are compared the difference between *galeritus* and *insolens* is very slight. In the former the base of the fur on the upperparts is whitish whereas in the latter the fur is concolorous throughout its length.

Judging by the specimens in the present collection the difference in the length of the forearm in the two forms is very small but *insolens* certainly averages larger: measured in the skin the lower leg (with claw) of *galeritus* ranges 24—26.5 mm. and that of *insolens* 27.8—28.5 mm.

Mr. Orolfo's measurements taken in the flesh confirm Lyon's remark that *insolens* may be distinguished from *galeritus* by its longer tail:—

H. galeritus, head and body, 47—49; tail 23—27 mm.

H. insolens, head and body, 44—55; tail 33—38 mm.

This bat has not yet been taken at Gomantong; all the specimens examined from that locality being *galeritus* as are a few from Miri on the coast of Sarawak.

10. *Myotis (Leucanoë) horsfieldi carimatae* Miller.

One ♂, 4 ♀ Tapadong caves (Nos. 348—351, 352).

Forearms.—♂ 38.5; ♀ 38, 38, 39, 39 mm.

Four of these specimens have the skull rather more inflated than in two *horsfieldi* from the Malay Peninsula thereby, on description at least, agreeing with *carimatae* Miller,¹ to which Thomas provisionally referred the Bornean race of *horsfieldi*. Another skull is noticeably less swollen: it may represent *Leuconoë lepidus* Thomas.²

11. *Myotis (Leucanoë)* sp.

One ♂ Madai caves (No. 46).

Forearm.—47 mm.

This skin which is unfortunately without a skull and therefore useless for critical examination appears to represent a large form of *Leucanoë*.

The upperparts are fairly uniform in colour, the base of the fur dark and the tips silvery grey: underparts white.

¹ Proc. U. S. Nat. Mus. XXXI, 1906, p. 62: Karimata Island.

² Ann. Mag. Nat. Hist. (8) XV, 1915, p. 171: Baram, Sarawak.

The only large-footed *Myotis* hitherto definitely known from Borneo are *horsfieldi* and *lepidus*, both much smaller animals.

12. *Miniopterus blepotis* (Temm.).

Three ♂, 2 ♀ Baturong, Madai and Tapadong caves (Nos. 47, 57, 82, 83, 334).

Forearms.—♂ 47, 49, 50; ♀ 48, 50 mm.

No species of *Miniopterus* was known from Borneo until Mr. Sody described *witkampii* (vide infra) in 1930 and at the same time recorded *M. medius* Thos., from the island: *blepotis* is another addition to the known Bornean fauna.

13. *Miniopterus witkampii* Sody.

Miniopterus witkampii Sody, Nat. Tijds. Ned. Ind., 1930, p. 272: Lobang Ipoe, Koetei, East Borneo.

Four ♂, 4 ♀ Madai and Tapadong caves (Nos. 38, 51, 344–347, 404, 405).

Forearms.—♂ 37, 38, 38, 38.5; ♀ 37, 38, 38, 39 mm.

14. *Emballonura rivalis* Thos.

Emballonura monticola rivalis Thomas, Ann. Mag. Nat. Hist. (8) XV, 1915, p. 140: Sarawak.

Four ♂, 1 ♀ Baturong and Tapadong caves (Nos. 134, 135, 361, 362, 464).

Forearms.—♂ 47, 47.5, 48, 48; ♀ 48.5 mm.

The measurements of three adults are:—head and body 45–55; tail 12–13; third finger, metacarpal 41–43, first phalanx 13; lower leg and hind-foot (c. u.) 25–26.5 mm.

Skulls.—Occiput to anterior base of canine 14.8–15.3; condyle to front of canine 13.5–14; zygomatic breadth 9.4–9.5; mastoid breadth 8; front of canine to back of m³ 6 mm.

15. *Emballonura monticola monticola* Temm.

One ♀ Tapadong caves (No. 465).

Forearm.—♀ 45.5 mm.

E. monticola and *E. rivalis* occur side by side in Borneo and are distinct species and not sub-species as is suggested by Thomas' nomenclature: both occur in Sarawak and in British North Borneo.

The measurements of three adults from British North Borneo are:—head and body 37–41; tail 11–15; third finger, metacarpal 40–41, first phalanx 12.5–13; lower leg and hind-foot (c. u.) 23.7–24 mm.

Skulls.—Occiput to anterior base of canine 13.8—14; condyle to front of canine 12.3—12.9; zygomatic breadth 8.3—8.9; mastoid breadth 7.4—7.5; front of canine to back of m^3 5—5.1 mm.

Forearms.—43—45.5 mm.

16. *Taphozous melanopogon fretensis* Thos.

Taphozous melanopogon fretensis Thomas, Journ. F. M. S. Mus. VII, 1916, p. 5: Pulau Terutau, Straits of Malacca.

Two ♂, 3 ♀ Baturong and Tapadong caves (Nos. 561—565).

Forearms.—♂ 62, 62; ♀ 60, 64, 64 mm.

The material of typical *melanopogon* available for comparison is not good but these rather pale specimens can be matched, or nearly so, by topotypes of *fretensis* which is a very variable form. One of the females listed above has the underparts white washed with grey on the throat and chest.

17. *Chaerephon plicatus* (Buch. Ham.).

One ♂ Madai caves (No. 281).

Forearm.—45 mm.

Like a few specimens from Samarang in Java (forearms 42—45 mm.) this single example from Borneo seems rather small but a good series of both sexes from West Java have the forearms measuring 46—49.5 mm. which is about the same range shewn by some from Tenasserim and the South Shan States. The type locality is India.

[Mr. Keith later forwarded some bats from the small caves on the islet of Berhala in Sandakan Bay. These included *Megaderma spasma trifolium* (Geoffr.), *Taphozous melanopogon fretensis* Thos., and *Hipposideros g. galeritus* Cantor.]

Birds from Bintang Island in the Rhio Archipelago

By F. N. CHASEN

Pulau Bintang is the largest island in the Rhio Archipelago. Its nearest point is twelve miles from the eastern corner of Johore at the southern extremity of the Malay Peninsula and although of irregular shape it may be said to be contained in a thirty mile square.

The island has been visited by zoological collectors on several occasions and although odd notes on its birds are included in a number of papers no account or list of its avifauna has ever been published.

Dr. W. L. Abbott made a collection of birds there in 1902, but it remains in the United States National Museum unstudied in detail.

Another small collection was made by Messrs. H. C. Robinson and E. Seimund of the Federated Malay States Museums Department in 1908, but again no list of the birds was published and they are now either incorporated in the general collection in the Raffles Museum, or no longer in our possession. By searching through the registers of the Selangor Museum we have been able to compile and append a list of birds obtained on various islands of the Rhio Archipelago during the 1908 visit.¹

The present collection was made by three native collectors of the Raffles Museum who visited the island for three weeks in May and June, 1930. Mr. H. Baker, a rubber-planter resident on the island, was kind enough to receive the men and generally facilitate their work. The birds obtained are mostly species common to the lowlands of the southern part of the Malay Peninsula and the central east coast of Sumatra. *Columba argentina* Bp., and *Piprisoma squalidum sordidum* Rob. and Kloss, are uncommon in collections. A few species including *Psittacula longicauda*, *Dissemurus paradiseus* and *Aplonis panayensis* run rather large on the island, thereby approaching the large races occupying the Anamba or Natuna Islands in the south China Sea. In the case of *Psittacula longicauda* the Bintang race seems identical with the undescribed large form found in the North Natuna Islands. We have also referred the Bintang race of *Aplonis* to a form described from the Anamba Islands. The existence on the island of two species of *Batrachostomus* and a trogon is interesting.

TRERONIDAE

Treron curvirostra curvirostra (Gmel.) 4 ♂, 2 ♀.

Wings. ♂ 135, 135, 137, 140; ♀ 135, 139 mm.

Treron fulvicollis fulvicollis (Wagl.) 7 ♂, 4 ♀.

Wings. ♂ 146, 147, 150, 152, 148, 141; ♀ 148, 143, 146, 150 mm.

We cannot separate females of *fulvicollis* from those of *baramensis* Meyer, of northwest Borneo.

One of the males listed above has the two outer primaries in each wing white.

The average wing-length of the Bintang series is high.

Treron vernans griseicapilla Schleg. 6 ♂, 3 ♀.

Wings. ♂ 140, 150, 145, 146, 145, 145 (imm.); ♀ 139, 147, 139 mm.

¹ The birds of the Rhio Archipelago were listed by Dr. K. W. Dammerman in "Treubia", viii, 1926, p. 319: This author also gives a list of literature (p. 325) to which can be added.—C. Boden Kloss, "Some visits to Batam Island", Journ. Straits Br. Roy. Asiat. Soc., 50, 1908, p. 61; and F. N. Chasen, "Notes on the Fauna of Pulau Galang, Rhio Archipelago, Journ. Malayan Br. Roy. Asiat. Soc., 3, 1925. p. 92.

Treron olax (Temm.) 3 ♂ (1 imm.); 1 ♀.

Wings. ♂ 125, 128; ♀ 124 mm.

Ptilinopus jambu (Gmel.) 1 ♂.

Wing. 143 mm.

Ducula aenea aenea (L.) 15 ex.

The wing range of the males is 238—247 mm. and that of the females 229—237 mm.

COLUMBIDAE

Columba argentina Bp. 1 ♀.

Wing. 232 mm.

Streptopelia chinensis tigrina (Temm.) 1 ♂, 2 ♀.

Wings. ♂ 141; ♀ 140, 140 mm.

FALCONIDAE

Haliastur indus intermedius Gurney. 1 ♂, ♀ 1.

BUBONIDAE

Ketupa ketupa ketupa (Horsf.) 1 ♂.

Ninox scutulata malaccensis (Eyton) 1 ♂, 1 ♀.

The small resident race.

PSITTACIDAE

Psittacula longicauda subsp. 4 ♂, 2 ♀.

Wings. ♂ 155, 157, 165; ♀ 156, 152 mm.

Like that from the North Natuna Islands the Bintang race is large.

Psittinus cyanurus cyanurus (Forst.) 1 ♂, 1 ♀.

Loriculus galgulus galgulus (L.) 2 ♂.

PODARGIDAE

Batrachostomus stellatus (Gould) 1 ♂.

A pale bird in colour agreeing with one of the same sex from Pahang.

ALCEDINIDAE

Ramphalcyon capensis malaccensis Sharpe. 1 ♀.

We do not consider that *hydrophila* Oberh. described from Singapore Island is separable from *malaccensis* the type locality of which is Malacca.

Alcedo meninting verreauxi De la Berge. 1 ♂.

Halcyon coromanda minor Temm. and Schleg. 1 ♀.

BUCEROTIDAE

Hydrocissa coronata convexa (Temm.) 5 ♀ (2 imm.).

Birds from the various islands of the Rhio Archipelago have small casques and should perhaps be separated subspecifically.

MEROPIDAE

Merops viridis viridis L. 5 ♂.

CAPRIMULGIDAE

Caprimulgus macrurus bimaculatus Peale. 1 ♂, 3 ♀.

MICROPODIDAE

Hemiprocne longipennis harterti Stres. 4 ♂, 3 ♀.

Hemiprocne comata comata (Temm.) 1 ♂.

TROGONIDAE

Harpactes duvauceli (Temm.) 1 ♂, 2 ♀.

CUCULIDAE

Surniculus lugubris brachyurus Stres. 1 ♀.

The small resident race.

Hierococyx fugax fugax (Horsf.) 1: ♀ 1 juv. ♂.

The juvenile was certainly bred on the island.

Penthoceryx sonnerati fasciolatus (S. Müll.) 1 ♀.

The dark Sumatran form which is also found in Singapore Island.

Rhopodytes sumatranus (Raffles) 1 ♂, 1 ♀.

Chrysocolaptes lucidus chersonesus Kloss. 3 ♂.

Wings. 153, 154, 156 mm.

Mulleripicus pulverulentus pulverulentus (Temm.) 3 ♂, 2 ♀.

EURLAIMIDAE

Eurlaimus javanicus harterti van Oort. 1 ♂. 1 ♀.

Eurlaimus ochromalus ochromalus Raffles) 2 ♂, 1 ♀.

HIRUNDINIDAE

Hirundo javanica abbotti (Oberh.) 1 ♂, 1 ♀.

MUSCICAPIDAE

Muscitrea grisola subsp. 1 ♂, 1 ♀.

In spite of our large series we find ourselves at present unable to divide this species into races (our reasons are given in full in Bull. Raff. Mus. IV, 1930, p. 51). A revision based on very extensive material is required.

Hypothymis azurea prophata Oberh. 4 ♂, 2 ♀.

Terpsiphone paradisi affinis (Blyth) 1 ♂.

In the chestnut phase.

CAMPEPHAGIDAE

Coracina sumatrensis sumatrensis (S. Müll.) 1 ♂, 1 ♀.

Wings. ♀ 154 mm. The male is so skinned that an accurate wing measurement cannot be taken, but it would certainly not be less than 160 mm.

PYCNONOTIDAE

Aegithina viridissima viridissima (Bp.) 2 ♂, 2 ♀; 1 ♂ imm.

Iolo olivacea olivacea Blyth 3 ♂, 2 ♀.

Alophoixus phaeocephalus phaeocephalus (Hartl.) 3 ♂.

Pycnonotus goiavier personatus (Hume) 2 ♀.

Pycnonotus plumosus plumosus Blyth. 1 ♂, 2 ♀.

Pycnonotus simplex simplex Less. 3 ♂, 1 ♀.

TIMALIIDAE

Aethostoma rostratum rostratum (Blyth) 3 ♂, 2 ♀.

Malacopteron cinereum cinereum Eyton. 4 ♂, 4 ♀.

Anuropsis malaccensis malaccensis (Hartl.) 5 ♂, 5 ♀.

Stachyris maculata (Temm.) 5 ♂.

Mixornis gularis gularis (Horsf.) 12 ♂, 11 ♀.

TURDIDAE

Copsychus saularis musicus (Raffles) 2 ♂, 1 ♀.

Kittacincula malabarica subsp. 1 ♀.

SYLVIIDAE

Orthotomus atrogularis atrogularis Temm. 3 ♂, 1 ♀.

Orthotomus ruficeps ruficeps (Less.) 2 ♂, 3 ♀.

LANIIDAE

Hemipus hirundinaceus (Temm.) 1 ♀.

DICRURIDAE

Dissemurus paradiseus platurus (Vieill.) 5 ♂, 6 ♀. 11 exs.

Wings of adults. ♂ 155, 154, 147, 148; ♀ 158, 146, 146 mm.
The average wing-length of 149 mm. is rather high for this race.

STURNIDAE

Gracula javana javana (Cuv.) 5 ♂, 3 ♀.

Wings. ♂ 177, 177, 183, 174, 184; ♀ 181, 178 mm.

Aplonis panayensis heterochlorus (Oberh.) 3 ♂, 1 ♀.

Wings. ♂ 106, 103, 103; ♀ 98 mm.

PLOCEIDAE

Munia atricapilla sinensis Blyth. 5 ♂, 3 ♀.

Passer montanus malaccensis Dubois. 1 ex.

Much darker than any other member of this race we have seen.

MOTACILLIDAE

Anthus richardi malayensis Eyton. 3 ♂, 2 ♀.

NECTARINIIDAE

Aethopyga siparaja siparaja (Raffles) 5 ♂, 5 ♀.

Leptocoma brasiliana brasiliana (Gmel.) 11 ♂, 3 ♀.

Leptocoma jugularis ornata (Less.) 3 ♂, 1 ♀.

Anthreptes malacensis malacensis (Scop.) 8 ♂, 6 ♀.

Arachnothera chrysogenys chrysogenys Temm. 2 ♂, 2 ♀.

DICAEIDAE

Prionochilus percussus ignicapillus (Eyton) 1 ♂.

Piprisoma squalidum sordidum Rob. and Kloss 2 ♂.

Dicaeum trigonostigma trigonostigma (Scop.) 7 ♂, 6 ♀.

APPENDIX

Birds obtained in the Rhio Archipelago in 1908 by Messrs.
H. C. Robinson and E. Seimund.

<i>Treron curvirostra curvirostra</i> (Gmel.)	Bintang.
<i>Treron vernans griseicapilla</i> Schleg.	Battam.
<i>Treron olax</i> (Temmm.)	Battam.
<i>Ducula aenea aenea</i> (L.)	Karimon.
<i>Columba argentina</i> Bp.	Karimon.
<i>Myristicivora bicolor bicolor</i> (Scop.)	Karimon.
<i>Rallina fasciata</i> (Raffles)	Kundur.
<i>Esacus magnirostris scommophorus</i> Oberh.	Bintang.
<i>Charadrius alexandrinus peroni</i> Schleg.	Bintang.
<i>Numenius phaeopus variegatus</i> (Scop.)	Bintang.
<i>Ardea sumatrana sumatrana</i> Raffles	Bintang.
<i>Polioaetus ichthyaeus</i> (Horsf.)	Battam.
<i>Ninox scutulata malaccensis</i> (Eyton)	Battam, Karimon.
<i>Psittacula longicauda</i> (Bodd.)	Bintang.
<i>Psittinus cyanurus cyanurus</i> (Forst.)	Kundur.
<i>Batrachostomus affinis</i> Blyth	Bintang.
<i>Ramphalcyon capensis malaccensis</i> Sharpe.	Bintang; Battam; Kundur.
<i>Ceyx rufidorsus</i> Strickl.	Kundur.
<i>Lacedo pulchella pulchella</i> (Horsf.)	Bintang.
<i>Hydrocissa coronata convexa</i> (Temmm.)	Pulau M e r a h, south-west of Karimon.
<i>Chaetura gigantea gigantea</i> (Temmm.)	Karimon, Kundur.
<i>Hemiprocne longipennis harterti</i> Strese.	Battam.
<i>Dryobates moluccensis moluccensis</i> (Gmel.)	Battam.
<i>Dinopium javanense javanense</i> (Ljungh)	Bintang, Battam.
<i>Pitta megarhyncha</i> Schleg.	Bintang, Karimon.
<i>Cyornis rufigaster rufigaster</i> (Raffles)	Bintang.
<i>Mixornis gularis gularis</i> (Horsf.)	Bintang.
<i>Copsychus saularis musicus</i> (Raffles)	Pulau T u l a n g, south of Kari- mon.
<i>Aplomis panayensis heterochlorus</i> (Oberh.)	Bintang, Battam.
<i>Munia atricapilla sinensis</i> Blyth	Pulau Sauh, Rhio Straits.
<i>Anthreptes malaccensis malaccensis</i> (Scop.)	Bintang.
<i>Zosterops palpebrosa williamsoni</i> Rob. and Kloss.	Kundur.



Termitarium in Mangrove forest containing Kingfisher's nest.

Nesting habits of the White-collared Kingfisher (*Halcyon chloris humii*, Sharpe)

(Plate VIII)

The accompanying photograph was taken on 20th June, 1928, by the late Mr. V. G. Bell of the Federated Malay States Forestry Department in the Matang mangrove forest reserve near Port Weld in Perak. Mr. Bell wrote "We saw, 15 feet up a *tumu*¹ tree, an ant's nest with a round bore-hole in its side. It seemed that some bird had been at work, either a Woodpecker after ants' eggs or else a Kingfisher pecking out a nesting gallery. Three minutes after this the forest guard reported two elliptical white-ants' nests,² only a few feet above the mud, both with holes bored in them. One was badly weathered and the top was falling in but it still contained swarms of ants. In its centre was a scooped-out circular depression containing unmistakable egg-chips, the remains of last year's Kingfisher's nest."

The second ants' nest found by Mr. Bell contained a Kingfisher's nest with three newly hatched young in addition to "ants in thousands".

Mr. H. C. Robinson³ has commented on the paucity of published information concerning the nidification of this Kingfisher but he mentions an account of its breeding in holes excavated in large termites' nests on the Selangor coast near Morib.

Writing of the Siamese race (*armstrongi* Sharpe) Mr. E. G. Herbert⁴ records—"The nest is nearly always made in a black ants' nest which is situated in a hollow tree at a height of about twenty feet from the ground" but he mentions that the nest is occasionally placed in a dead tree stump and also records a nest in a white-ants' hill about three feet high.

¹. One of the mangrove trees (*Bruguiera gymnorhiza* Lam.).

². According to Mr. H. M. Pendlebury these are the nests of a species of *Eutermes* (Order *Isoptera*: Termites).

³. "The Birds of the Malay Peninsula", I, 1927, p. 100.

⁴. Journ. Nat. Hist. Soc. Siam, VI, 1924, p. 310.

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